The Mining Journal

LONDON, OCTOBER 10, 1958

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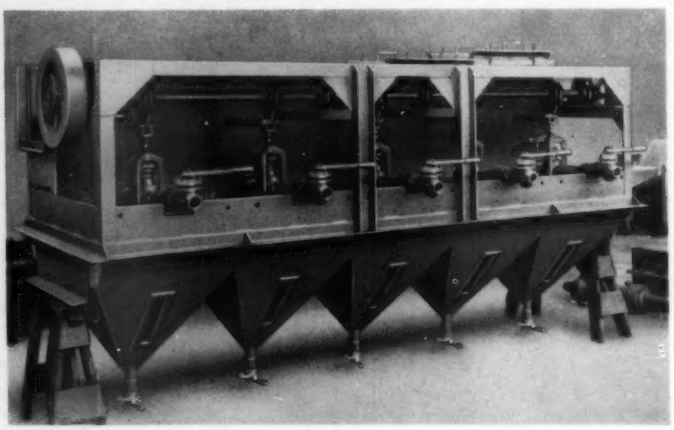

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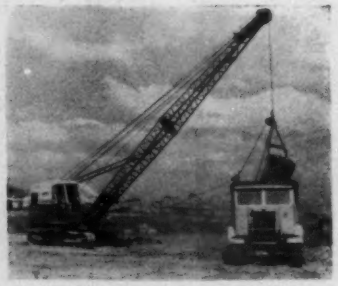

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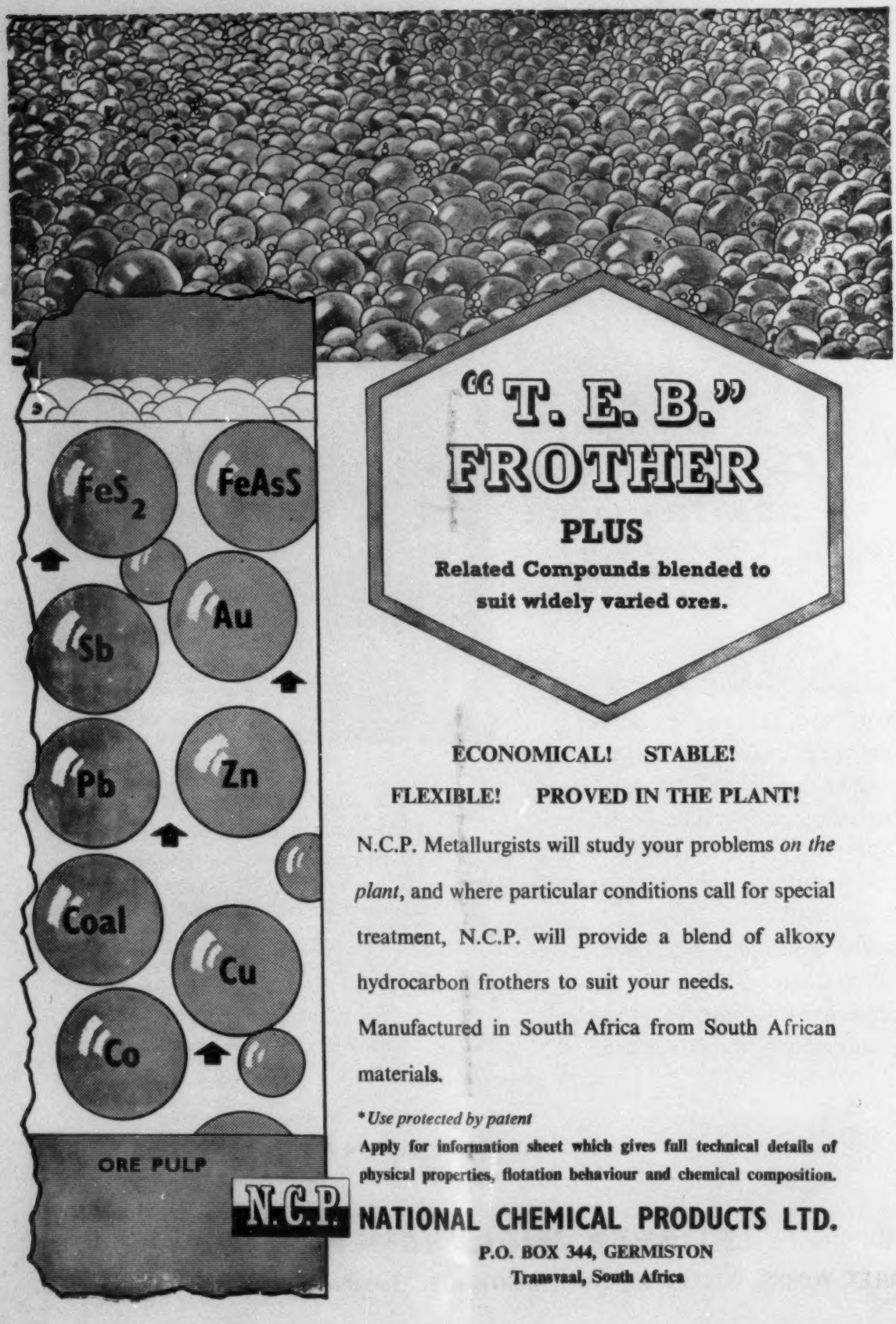

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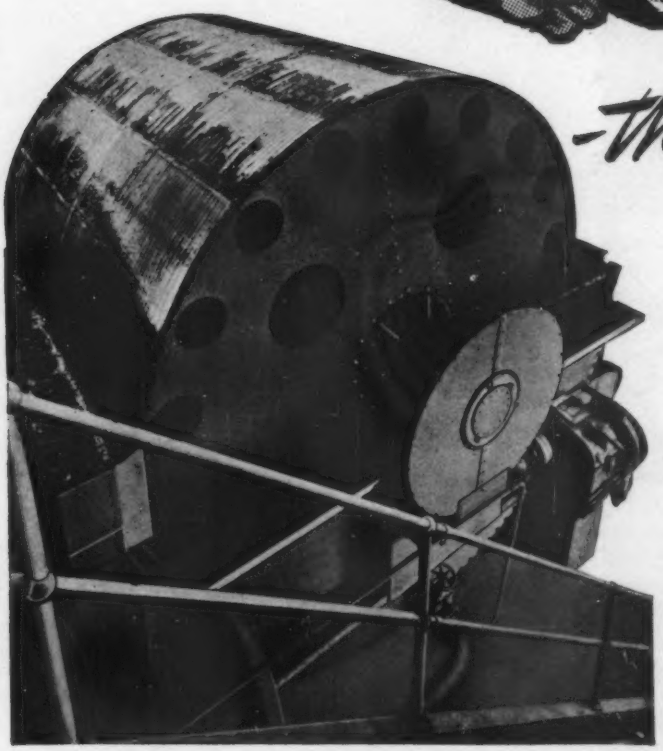

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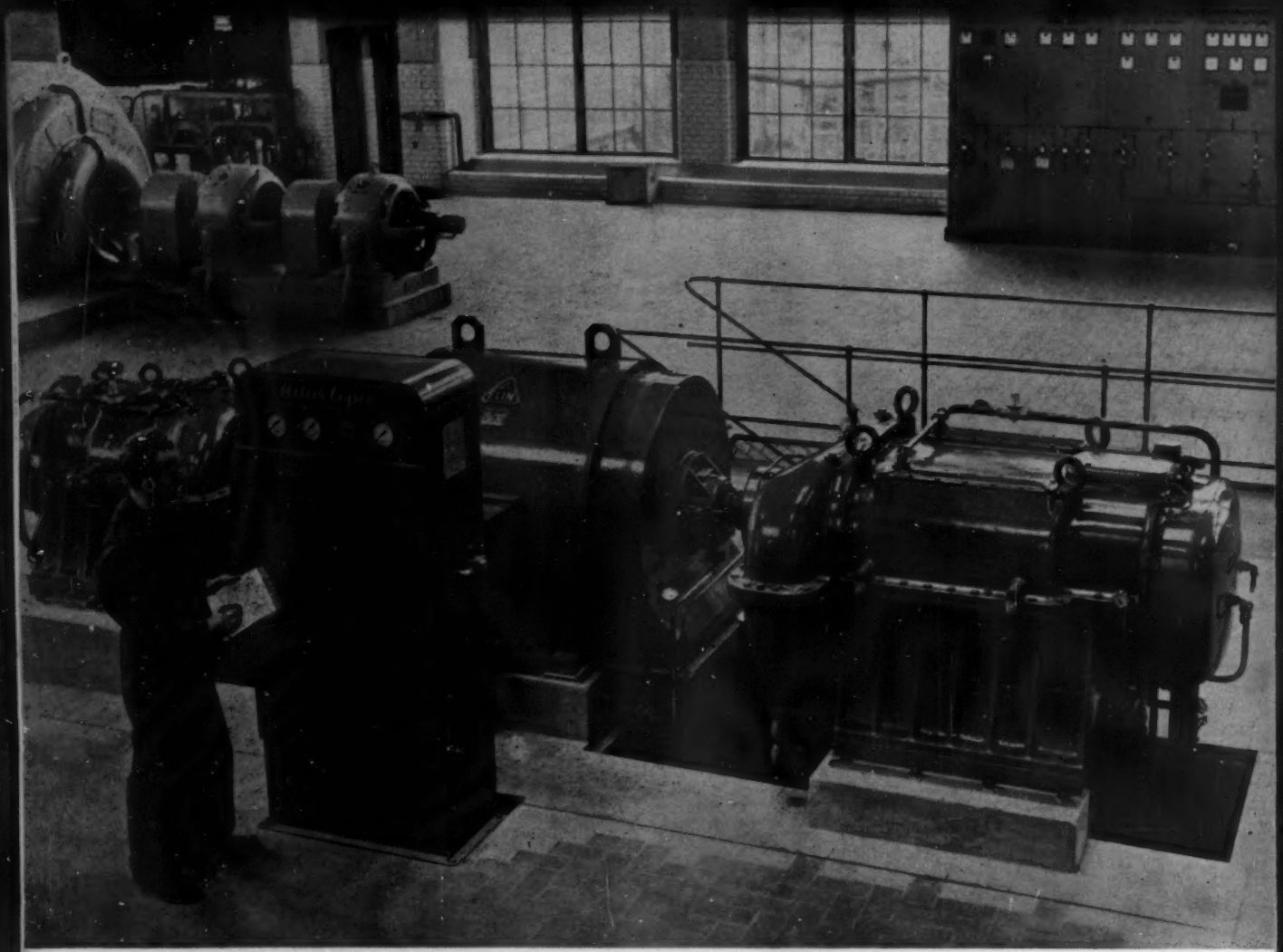

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The Mining Journal

London, October 10, 1958

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It Still Depends on the Geologist

A PAPER on "Exploration Procedure at Inco", prepared by Mr. R. D. Parker, Vice-President of the International Nickel Co., for presentation at the annual convention of the American Mining Congress held recently in San Francisco, is of interest on two counts. In the first place what he says tends to re-emphasize the argument put forward by Dr. Anton Gray in his recent Sir Julius Wernher Memorial Lecture that geophysical and geochemical techniques, while most vital aids to the geologist, are still essentially aids, and as such are dependent for their success on the geologist's correct reading of rock formations.

Secondly, Mr. Parker's description of how the Thompson nickel project evolved in its early stages is a useful reminder of the considerable period which must normally elapse between the geologist's preliminary identification of a promising mineralized area and the stage at which the plans for a specific mine are formulated and a purchasing programme initiated. The mining consultant and mining machinery manufacturer who are equipped to follow the progress of geological search around the world, in the public no less than in the private sector of the economy, can thus often infer where prospective new mines will sooner or later become established long before the question arises in practical form of just how they are to be financed or, in the case of some of the undeveloped areas still dependent on outside technical aid, in which countries this aid is likely to be sought. The importance of this foreknowledge in terms of the eventual sale of know-how and equipment needs no stressing.

In the course of his paper, which in his absence was delivered to the convention by Mr. C. E. Michener, Vice-President of the Canadian Nickel Co. Ltd., Mr. Parker emphasized that many of the significant mineral discoveries made in Canada since the Second World War were initially the result of airborne geophysical methods or were extended and developed by the use of such methods.

Mr. Parker stated also that although new tools and new ideas generally continue to grow more efficient, and although much could be learned about the physical properties of a hidden deposit, "the chemical nature which determines its economic value remains a challenging problem for the future".

To illustrate that not all significant ore deposits are found by the straightforward application of developed methods, Mr. Parker revealed for the first time how the Thompson orebody in northern Manitoba was discovered. The nickel district of Manitoba was selected as an area of major exploration in 1947, mainly on the basis of structure and the presence of ultrabasic rock. Following an airborne magnetometer survey in 1948, attention was drawn to magnetic anomalies of relatively low intensity which might be produced by sulphides. However, the discovery of the Mystery Lake and Moak Lake nickel occurrences diverted efforts to the high intensity anomalies characteristic of these deposits. It was not until the advent of the airborne electromagnetic equipment that attention was drawn to the Thompson anomaly. Although the subsequent reconnaissance ground investigation showed that this

response had good magnetic and conductive characteristics, it was not given top drilling priority because of continued pre-occupation with high intensity anomalies.

In 1954 the anomaly was staked and this was followed by a detailed geophysical survey. Interpretation of these results convinced that this anomaly should be drilled, but it was not until the winter of 1955 that a drill movement made it convenient to test the ore possibilities. The first hole was completed in February, 1956. Thus, almost five years had elapsed between the detection of the anomaly from the air and the actual discovery of nickeliferous sulphides.

Continuing, Mr. Parker pointed out that Inco's operations have made it apparent that airborne electromagnetic equipment is a valuable asset in the evaluation of geologically favourable terrain. He added, "Despite many problems, the stage has been reached where it is possible, with the benefit of techniques employing airborne geophysics, to locate a diamond drill on an anomaly in a new area and be reasonably sure that nine times out of ten the anomaly drilled was caused by sulphide of some kind.

"Geophysics has made great strides in the past ten years, but it is not by itself an assured means to a desired end. Geological guidance is required, not only in selecting the area concerned, but in following up the results. Geochemistry might assist in the elimination of the costly drilling of barren sulphides and graphite-magnetite combinations. It can be categorically stated that, in Inco's experience, in pre-Cambrian areas of deep overburden and in those areas where lacustrine clay deposits occur, geochemistry has proved to be a failure."

There would appear to be a great challenge for a concerted drive by the geologist, the geophysicist and the geochemist to produce the ultimate measuring stick which will take much guess-work out of ore finding.

FOCUS ON NEW DELHI

This week's I.M.F. and associated meetings in New Delhi have been preceded by the publication of the annual reports of the World Bank (The International Bank for Reconstruction and Development to give its official title) and of the International Finance Corporation. These two agencies, both deriving from the I.M.F., are the principal channels through which finance is made available by international co-operative effort to what are in the main the less highly developed areas of the world. In the case of the World Bank loans are channelled through member governments, while the I.F.C. lends directly to individual enterprises within member countries. The membership of both organizations covers the great majority of the countries of the Free World, that of the I.F.C. (which is only two years old) being as yet slightly the more limited.

A notable aspect of the World Bank's operations, more particularly during the past year, has been the extent to which loan disbursements have been financed through normal commercial borrowing. The Deutsche Bundesbank has, for example, lent the bank a total of $250,000,000, maturing at intervals up to mid-1961.

The World Bank's thirteenth annual report re-emphasizes the extent to which its loans are aiding the mining industry all over the world, either directly or at second-hand through the facilitation of improved public utility services. A number of these operations will already be familiar to our readers, but we summarize them here by way of emphasizing the present scope and, still more, the potentialities of this kind of finance, more especially in the context of the proposals now under consideration in New Delhi for expanding the Bank's resources and thus its lending potential.

Loans made for industry totalled $107,000,000 and were largely concerned with expansion programmes in steel and coal. This lending will help to complete an increase of nearly 100 per cent in the steel capacity of the Tata Iron and Steel works in India; in Japan another private company, the Kawasaki Steel Corporation, is receiving funds for the expansion of pig iron production. In Chile, the efficiency of the coal industry is being increased by two loans for the sinking of new shafts and for carrying out other modernization work being undertaken by the two largest coal-mining companies.

In Southern Italy, the Bank's industrial lending is helping the Casa per il Mezzogiorno to finance the introduction of potash mining and processing in Sicily, as well as the expansion of tinplate manufacture and the modernization and the improvement of several consumer goods industries.

Nine Bank loans totalling more than $300,000,000 have contributed directly or indirectly to a remarkable transformation that has taken place over the last decade in the Damodar Valley in India. This relatively small area, with its population of 5,000,000, has long been one of the richest agricultural areas of India. The Damodar Valley area also provides almost all of India's iron and copper and three-quarters of its coal, mica and chromite.

The way to full realization of the economic possibilities of the Valley has been barred up to the present by the sudden monsoon storms which have always exposed the Damodar Valley to the danger of flash floods; the river has been known to rise as much as 5 to 10 ft. in a few hours. The Damodar Valley Corporation, set up with the object of putting the waters of the Valley to productive use, has already completed, or nearly completed, four large multipurpose dams—three of them, Maithon, Panchet Hill, and Konar, with the assistance of the Bank. These dams are also making a substantial contribution to the electric power resources of the Valley.

Bank lending to India's two private steel companies has also directly assisted the development of the Valley. The Indian Iron and Steel Co. is greatly increasing its capacity. With the help of $50,000,000, lent by the Bank, one new blast furnace was brought into operation during the year and another is expected to be completed by the end of 1958. Completion of the expansion will allow the company to raise its annual output to 800,000 tons of finished steel, compared with less than half that tonnage before the programme was started.

The Damodar's emergence as a centre of heavy industry for the whole of India has been facilitated by loans for the Indian Railways, of whose freight, about 40 per cent consists of coal and other minerals, the greater part of which originate in the Valley area. An early loan for post-war rehabilitation of the rail network helped to make possible a steady growth of freight traffic, which in recent years has been rising by nearly 10 per cent annually.

In November, Mexico's Pacifico Railroad held a ceremony in Hermosillo to mark the completion of a rehabilitation programme which had equipped the line, first opened 70 years ago, to meet the traffic needs of today. The Railroad was in a dilapidated condition when it received a loan of $61,000,000 from the Bank in August, 1954. Where previously the Pacifico Railroad had owned very little freight equipment of its own, it now has over 1,600 new steel boxcars. Copper from Cananea, near the U.S. border, now makes the journey to Guadalajara in eight days compared with fifty days previously. Agricultural produce, which took almost as long for the journey in 1952, now takes about three days.

When the Bank loan to the Pacifico Railroad was signed in 1954, it was the largest that the Bank had yet made for a single project. The loan agreement allowed a five-year

grace period before any repayment of principal became due. Four of these five years have now elapsed; the railway has already been rebuilt and is bringing new prosperity to north-western Mexico.

Two years ago the Bank took part in an international financing operation, which enabled the new Federation of Rhodesia and Nyasaland to arrange for work to begin on the first stage of the Kariba hydro-electric power scheme, one of the largest projects of its kind now being built anywhere in the world and of great importance to the future expansion of Copperbelt operations.

The Bank has also financed coal production in Chile. The idea behind the project was the modernization and expansion of Compania Carbonifera e Industrial de Lota, and Compania Carbonifera y de Fundicion Schwager, two companies whose coal mines are located on the Bay of Arauco, about 300 miles south of Valparaiso.

Both companies are opening new mines and had made considerable investments in sinking new shafts and installing some equipment before the Bank loans were made. The total cost of the work to be undertaken in developing the two mines during 1957-1962 is estimated at the equivalent of $41,600,000. The Bank loans will provide most of the foreign exchange requirements during that period, and will pay for such imports as equipment for face and development work, coal haulage installations and coal preparation plants.

Chilean coal now accounts for about one-fourth of the country's total energy supply. The Schwager and Lota companies produce about 80 per cent of all the coal mined in Chile, and the modernization and expansion of their operations is essential if Chile is to continue to produce most of its own coal requirements. The projects being carried out with Bank assistance will enable the companies to increase production from a level of 1,700,000 tons a year to 2,200,000 tons by 1964. To import this much coal would cost $40,000,000 in foreign exchange annually.

Turning to the report of the International Finance Corporation, very little has as yet been done in the mining field. Indeed, a loan of $2,200,000 to Montos Blancos, a Chilian Corporation engaged in the development of a copper mine and smelter in the Antofagasta region of northern Chile, is the only item reported, and even this loan is less than 20 per cent of the total investment in this project.

It is, of course, early days to assess how far I.F.C. facilities are likely to benefit the mining industry. On the evidence to date it would, however, seem as if the loans made by this Corporation are unlikely to carry a high element of risk. In any event, investment by the Corporation, which is intended to take a form midway between conventional loan capital and ordinary share capital, does not readily lend itself to the kind of risk bearing normally associated with mining.

MINING'S INFINITE VARIETY

The Southern Counties Institute of Mining Engineers holds its first ordinary general meeting at the Institution of Mining Engineers headquarters, London, today. The new Institute was formed at an inaugural meeting on January 22 this year, and became the ninth federated institute of the Institution of Mining Engineers on April 19, 1958. The first president of the Institute is Dr. H. L. Willett, deputy director-general of production (safety and techniques) of the National Coal Board. The first vice-presidents are Professor J. C. Mitcheson, a past-president of the Institution of Mining Engineers and now head of the mining department of the Royal School of Mines, and Mr. T. A. Rogers, H.M. Chief Inspector of Mines.

In his presidential address, the highlights of which we summarize below, Dr. Willett draws attention to one of the unique characteristics of coal mining, namely its need to cope with the tremendous forces set up by the movement of the mass of strata between the coal seam and the surface of the earth caused by the extraction of coal. No other industry is faced with such a set of circumstances in which the roof and sides and the floor of the working places and the transport avenues are on the move continuously, despite the erection of supports. The moving material which has to be controlled by supports is of variable strength and of variable behaviour, which, despite all the help geologists have given, are in many cases unpredictable.

On account of geological factors and the depths of working, it is now generally considered that the system of room and pillar mining can rarely be applied in this country in the way in which it is employed in the United States. At present, the amount of room and pillar output is only approximately 6 per cent of the total national production, and there is every reason to believe that the proportion of coal won by this system will continue to fall.

One reason why longwall retreating has also frequently proved unattractive in practice is that there has been the long wait for the completion of development before full production from the retreating faces could be obtained. There are, however, as pointed out in the Reid Report of 1945, means available for considerably accelerating this work.

Research and experience in the United Kingdom have brought an understanding of certain general characteristics of ground movement, but because of the variability of conditions the stage has not yet been reached when it is possible to predict sufficiently the effects on roads and coal faces that will result from a system of mining or a method of extraction. Yet so far as the coal face is concerned, Dr. Willett suggests that at no time in the history of mining has such great progress been made in the application of supports to the control of ground movement as has been accomplished during the past ten years.

The industry is still in the position of having to design a system of support individually for each coal face and thereafter of modifying it in the light of results achieved on that face for a given method of extraction. There has also been progress in the support of roads. In 1957 some 14,000 miles of road were systematically supported (80 per cent by steel), compared with 12,000 miles in 1937 (46 per cent by steel). Much has been accomplished in an attempt to reduce roof movement, and improved packing has often brought its reward by reducing the cost of road maintenance.

Considering those circumstances under which trials of systems of mining can be carried out, it is apparent that the work must be completed underground in a mine, as there are too many unknown variables for the conditions to be reproduced on surface. Thus Dr. Willett sees the mine as a laboratory as well as the pilot plant. All too often the immediate and pressing need for increased output has meant that at the first signs of possible failure of a modified system of mining it has become necessary to revert to the longwall advancing system to ensure continued output. Thus, unavoidably valuable information is neither obtained nor collated.

Suggestions have been made that there ought to be an experimental mine for this kind of research. Such an arrangement would, of course, be of assistance in trials to modifications in systems of mining. It is open to argument, however, whether the advantages of the completed tests would outweigh the disadvantage of having to attempt to use results obtained under one set of geological conditions for the design of a system of mining at a working mine having different geological conditions.

Safety Hazards in Uranium Mines

URANIUM activity has introduced a comparatively new hazard to mining. In addition to the hazards common to all mines, uranium mines have a complex health problem of radiation damage. Like many new processes, radiation and nuclear energy can be made to serve man in many useful ways when properly understood and handled; but, like fire, gases, and electricity, their potential dangers must be known and respected, and appropriate precautions must be taken or death may result.

Since 1950 the Public Health Service has been conducting basic investigations on exposure to radon and its daughter products and the effect of exposure upon the health of miners in uranium mines of the Western States. The Bureau of Mines assisted in several of these investigations, especially in mines on Indian lands. The studies have shown that a serious health hazard exists from radioactive exposure that might cause lung cancer if continued over a number of years. The Public Health Service report, Control of Radon and Daughters in Uranium Mines and Calculations on Biologic Effects, shows that 55 per cent of the uranium mines employing 64 per cent of the miners had atmospheric concentrations more than five times the working level now accepted as reasonably safe for industrial exposures. Extensive control measures are necessary to reduce these concentrations to the suggested working level of less than 300 micromicrocuries of total radon daughter products per litre of air.

Types of Radiation

The three units of radiation that predominate in most uranium mines are alpha, beta, and gamma emissions. An alpha particle is identical with the nucleus of a helium atom, and, because of its comparatively large mass, will not penetrate the skin. Alpha particles can enter the body by inhalation or by ingestion of the radioactive material producing it.

A beta particle has a single negative charge and a mass equal to that of an electron. Although primarily an internal hazard, beta radiation produces severe burns if the victim is exposed at short range to an exceptionally beta-active and radioactive surface.

A gamma ray is a short-length electromagnetic wave produced by radioactive decay. It is a photon of energy nearly identical to X-ray. The gamma ray does not possess mass, but it has energy and consequently the power of destroying human tissue. In mining operations most of the danger is damage from alpha and beta particles.

The safety and health hazards of uranium mining are more complex than those of ordinary mines. In addition to the hazards common to all mines, health can suffer through exposure to radiation. There can be no comparison in this respect between American and European mines, as mines in the U.S. are not as deep, they yield a simpler ore, and American workers seldom are underground more than 40 hours a week. Investigations into the health hazard have shown, however, that a serious health hazard does exist from radioactive exposure, that might cause lung cancer if continued over a number of years. The following article, the first instalment of two, is condensed from *Information Circular* 7834, published by the U.S. Bureau of Mines.

The activity of a radioactive substance usually is measured in curies. A curie is defined as the quantity of radioactive material that emits 2.22×10^{12} atomic disintegrations per minute.

Occupational Hazards of Uranium Mining

Air impurities in uranium mines include radioactive dust and gas, gas and smoke from blasting, dust from mining operations, and exhaust gases when diesel-operated equipment is used. The principal harmful gases comprising the exhaust from diesel-powered equipment are carbon dioxide, oxides of nitrogen, oxides of sulphur, carbon monoxide, and aldehydes.

The Bureau of Mines in 1949 issued a schedule for permissibility and suitability tests covering Procedure for Testing Mobile Diesel Powered Equipment for Non-coal Mines and included recommendations for the use of diesels underground. This schedule (No. 24) was revised in April 1955. It is strongly recommended that only diesel equipment approved by the Bureau of Mines be used underground.

The significant hazard in mining uranium arises from radon and its decay products. Unless dust-control measures are adequate, miners may develop silicosis, as most of the uranium ores on the Colorado Plateau occur in sedimentary rock containing 30 to 70 per cent free silica. Toxic effects also may result from inhalation of uranium dusts.

Radon and Its Decay Products

In uranium mining radon and its two energetic alpha-emitting daughters, radium A and radium C^1, are considered the most harmful radioactive products. In mine workings radon is emitted from the ore and water seepages and disperses throughout the atmosphere of the mine. The concentration of radon often increases with rock blasting and drilling.

Radium A and radium C^1 are positively charged radioactive nuclei that adhere to negatively charged dust particles ever present in mine air. These dust particles, to which the radioactive nuclei are attached, and the radon enter the bronchial tubes and lungs through inhalation.

The harmful effects of over-exposure to such radiation may lead to cancer of the lungs.

Experience in European Mines

In European mines, recognizable health damage due to exposure to radon is confined almost entirely to mines in the Ezra Mountains — the Schneeberg mining region of southern Germany and the adjoining Joachimsthal region of Czechoslovakia. Both regions have been mined since the 15th century for silver and other metals. By the end of the 16th century the silver veins were exhausted, and the regions were mined for cobalt, nickel, bismuth, and arsenic. After Madame Curie discovered radium in 1896, pitchblende in these mines was exploited for its radium content.

As early as 1878, reports began to be circulated of a high incidence of lung cancer among miners of the area. According to medical reports, 50 to 70 per cent of all deaths in these mines were due to primary cancer of the respiratory system. The cause of these lung cancers has long been controversial and has been attributed to cobalt, nickel, or arsenic. It was

suspected that radon might be a hazard to miners, so radon concentrations were measured.

At present the predominant opinion is that radioactivity caused the high incidence of lung cancer. It is possible, however, that no single agent can be blamed but that combined factors of environment are implicated, which are difficult to evaluate.

Uranium Dusts

The uranium dusts to which miners of the ore might be exposed are uranium dioxide (UO_2), uranium trioxide (UO_3) uranium peroxide (UO_4), and uranium tritaoctoxide (U_3O_8). The toxic effects resulting from inhalation of uranium dusts depend upon the physical characteristics of the dust as well as the chemical nature of uranium. Particle size, density, and solubility are most important because they affect the amount of inhaled uranium retained in the respiratory tract and the rate at which uranium is transported from the respiratory tract to the kidneys, where it has its primary toxic action.

The results of a recent study on animals conducted by Voegtlin and Hodge showed that :

1. Uranium dioxide was relatively non-toxic when inhaled as a dust in repeated daily exposures. Only at a high level of exposure was toxicity discernible.
2. Uranium trioxide dust was more toxic than expected, owing to its higher solubility in blood plasma than in water.
3. Uranium peroxide is fairly soluble in serum but highly insoluble in water. It is very toxic when inhaled as a dust.
4. Uranium tritaoctoxide, when inhaled as a dust in repeated daily exposures, produced only occasional mild toxic reactions in a 26-day period.

Other Safety and Health Hazards

The safety and health hazards in uranium mining, besides those already mentioned, are similar to the hazards in other mines in the same areas. Uranium mines vary in size ; in the past, any mine employing 10 men was considered large, and few mines employed more than 25 men. Distance and isolation of many uranium mines also pose such problems as lack of water, electric power, and timber.

Many underground uranium mines have been fortunate in having good roofs. Frequently, however, natural pillars needed for roof support were mined out, leaving large openings without adequate roof support. Robbing existing pillars while mining on the advance has often left the same condition. In many instances, mine timbers must be hauled long distances. This fact increases the cost and the difficulty of maintaining an adequate supply. Too often, mining has continued without proper roof support, and dangerous roof conditions have developed.

Falls of ground are always a big hazard in underground mines. Uranium miners can benefit from the lesson learned in a recent campaign conducted by the mining section of The National Safety Council. Some 300 mines enrolled in an attack on the problem of injury from falls of ground. The programme continued during 1955 and resulted in an average reduction of 29 per cent in roof-fall accidents compared with the previous records of the same mines. In addition to the progress made during the campaign, there was a further decrease of 17 per cent during the first half of 1956.

Many uranium deposits could readily use rock bolting for roof support, and more consideration should be given to adoption of this method. As of July 1, 1957, rock bolting was the practice in 181 non-coal mines throughout the United States. The services of Bureau of Mines engineers are available for testing mines and advising management on the possibilities of rock bolting for roof supports.

Measures for Controlling Occupational Hazards

Ventilation for Control of Radioactivity. On the basis of available information, a safe general rule is that adequate protection against internal radiation hazards can be provided by proper ventilation and dust control, in accordance with good mining practice, combined with the personal hygiene measures that have been accepted as necessary in the mining industry. However, in some mines more ventilation is necessary to reduce the radon concentration to the recommended standard than would be required normally to meet good mining practice.

Too many underground uranium mines are operating with inadequate natural ventilation. Proper distribution of air underground demands careful thought and planning, so that clean air will be conveyed as directly as possible to the working places, where it may dilute and remove harmful dust concentrations. Mechanical ventilation should be planned and designed before mining begins and maintained as mining or exploration advances. A split system of ventilation should be used wherever possible. Additional openings not only aid ventilation but provide second exits usually required by State mining laws. With good ventilation the concentration of radon and its daughter products may be held below 300 micromicrocuries per litre of air, and radon may be removed from the mine before extensive decay to its more harmful radioactive daughters occurs. A fundamental misconception carried over from standard mining practice is the delivery to the working face by auxiliary blowers of air picked up in underground workings. The air must be outside air or filtered air from the mine. Radon is released to the mine air throughout the mine workings 24 hours a day, year after year. The concentration in the mine atmosphere when equilibrium is reached ranges from 50 to 100,000 micromicrocuries per litre. As ventilation is essentially a process of diluting the contaminant in the air, the contaminant cannot be diluted with air that has as high or a higher percentage of the contaminant, hence outside air or filtered air must be delivered at the working face of the mine. Although filtration with the proper mediums removes the radioactive nuclei and dust particles, it does not remove the radon. Each mine offers a unique problem and must be considered individually.

In some mines the air is forced to the lower levels and allowed to find its way to the surface through the workings. This should not be done where radon is present. It is necessary to " bleed off " fresh air at frequent intervals so that it may ventilate the immediate workings and then flow from the mine by the shortest route. Once the air is contaminated it cannot be re-used without generous dilution. As liberation of radon varies considerably in different mines and in different parts of one mine, the only practicable method of determining whether ventilation is adequate is by determining the concentration of radioactive substances in the mine air. This requires technical training and special equipment.

Sealing off old workings reduces the amount of radon being released to active areas of the mine. To do this, a bulkhead made of 2 by 4's and ½-in. plywood is sometimes used. It should be built as airtight as possible by cementing all joints with concrete.

Auxiliary fans and vent tubing can be used in stopes that are not ventilated by the main air current. Raises, especially the untimbered type, are more difficult to ventilate. Timbered raises usually are not so difficult to ventilate, as vent tubing can be extended as raises are advanced. Experience at Phelps Dodge Corp., Visbee, Ariz., showed that satisfactory dust control in raises was possible only where tubing was carried 2 feet above the drill platform.

THE diamond mining industry in British Guiana is roughly fifty years old and employs many thousands of persons, mostly itinerant diamond miners who recover the diamonds by hand methods and very much arduous labour.

From 1901 to 1954, 2,583,297 metric cts. of diamonds were recovered in British Guiana, practically all by hand, from thousands of small placer workings. Until 1919 annual production was less than 20,000 cts. but it rose to a peak of 214,474 cts. in 1923 (168,000 of these being from the Mazaruni field), decreasing to the lowest figure of about 15,000 cts. in 1945. There has since been a slight rise and the production in 1957 was 29,037 cts.

British Guiana's

It is difficult to obtain definite information regarding the average size and quality of British Guiana diamonds. Figures given by well-known diamond buyers in the Colony indicate that the present average size is about 10 stones per ct. and a comparison of gem stones to industrials yields a proportion of approximately 3 : 1. The average size has diminished since 1923, when there was an average of 5.32 stones per ct.

Diamond Resources

In British Guiana there are four main types of diamond alluvial deposits, namely : high alluvial deposits (or White Sand Series), terrace deposits, river flats, and deposits directly associated with the plateau. All four types of deposits occur in the Mazaruni field, which is by far the largest in British Guiana, as well as in other localities.

The high alluvials or hill deposits were tentatively correlated with the White Sand Series by Bracewell[1] who thought that they might represent the remnants of a riverine marginal deposit of that series. They vary in thickness from 10 to 70 ft., lie between 300 and 400 ft., and consist of loose quartz sands, gravel, and clay. Zircon, ilmenite, rutile, and tourmaline, occur in the sands.

Attempts to prospect and work the hill deposits for diamonds have not met with much success. However, diamond workings are closely associated with them and if the deposits are reconcentrated by present drainage they usually yield diamondiferous gravels which can be worked economically.

The terrace deposits are extensive and lie between the elevation of the high alluvial deposits and the level of the main drainage. They are related to the present drainage and have been derived from meander channels cut through the older high alluvials and into basement rocks. The terraces can easily be recognized by their flat, raised character and their material, which consists of coarse angular quartz sand mixed with well rounded white quartz-pebbles up to 1 in. long.

The river flats are directly related to present-day drainage and form broad belts from ¼ to 1 mile in width on both sides of the Mazaruni River. These belts are quite frequently flooded during high water, except for the older terraces and occasional small hills which rise above the flood level. The alluvial flats represent the last stage of deposition of alluvial material.

The deposits directly associated with the plateau are regarded as including the most productive diamond areas which, according to Bracewell, are situated near the Kaieteurian (Roraima) escarpment and more particularly in proximity to the gorges in the scarp which have been eroded by rivers draining large areas of Kaieteurian rocks in the Pakaraima Mountains.

The gorges have long formed " bottle-necks " for the alluvial material derived from the mountain areas and poured out on to the plains below, and the workable diamond deposits are largely the result of the redistribution of the alluvial fans radiating from these gorges. It has been observed that the workings are mainly confined to the belts covered, or formerly covered, by deposits of the White Sand Series. Where streams are too flooded to permit of normal alluvial working, the diggers often resort to the bottoms of the escarpments. The top few inches of soil in the shelter of large boulders of sandstone or conglomerate often contain diamonds.

Methods of Extraction

The diamond is usually recovered from gravel bands located at or close to the surface in the shallow deposits and attaining a depth of 20 ft. in the deeper type. The usual method of exploitation is the tom and box method, which has been described.[1]

In the Potaro District a simple hand-operated jig known as a " jig-jig " is in widespread use. Used in conjunction with a sluice, tom (or trommel) and " baby ", it is ideal for working large quantities of backsand. Its adoption in other fields would help in the exploitation of large deposits. The principle of this jig is that water is pulsated through the gravel as it is passing through a sieve box with small baffles, by means of a simple internal pump. This causes the light fractions to lift and eventually escape over the overflow, whereas the heavy concentrate, including the diamonds, remains behind the first baffle in the sieve box. The advantages of the " jig-jig " are easy construction and continuous operation throughout the day. The disadvantage is the need for a good supply of running water.

Motor-driven diamond washing pans 5 and 6 ft. in dia., which can treat about 18 cu. yds. of gravel per day, are also used, as are smaller hand-operated pans. The recent discovery and recovery of payable quantities of diamonds from gravels in the bed of the Ireng, Potaro and Mazaruni Rivers and some of their tributaries has arrested to some extent the decline in production from these fields.

Diving Technique

The diving technique for the recovery of diamonds in British Guiana is believed to have first been successfully tried in the Ireng River, on the Colony's frontier with Brazil. Heavy minerals tend to concentrate above and

For many years the British Guiana Geological Survey has been investigating the Colony's diamond fields and recording information from many sources. Existing knowledge is reviewed by E. R. Pollard, C. G. Dixon, and R. A. Dujardin, in the Survey's Bulletin No. 28 (price $1, or 4s. 2d.). Consideration is given to future possibilities.

below falls and rapids in the rivers which have been formed by bars of resistant rock. Diving is usually limited to pools not more than 50 ft. deep with a slow-moving current. The gravel is scooped up by hand or shovel and put into a small bag, which is hauled up at a given signal to a boat lying vertically overhead. Each diver sends up ten bags of gravel, and to do this he will be under water from ¼ to ½ hr. The gravel is taken ashore and hand-jigged to recover the diamonds. Seven men in the Mazaruni River at Apaiqua recovered 500 cts. in about eight days in 1953, using these methods.

Up to the present time dredging for diamonds has not been successful. In 1947, attempts were made in the Kurupung River using a small clam-shell dredge and jigging plant, but were abandoned. It is suggested that a Walburg pump unit of greater capacity would be more appropriate.

At present, attempts are being made to work gravel banks in the Kurupung by means of a suction unit mounted on an American army amphibious vehicle. It is understood that a small recovery has been made but no details are yet available.

Future Possibilities

It is considered that the days of small parties of prospectors working in individual claims are numbered. The main potential of the diamond industry is seen as lying in the large-scale mechanized exploitation of the terrace deposits. From 1950 to 1952 the Kurupung Placers Co. carried out exploration by pitting and drilling for diamondiferous gravels which could be worked on a large scale in the Kurupung River area.

Webber[2] computed that there are very approximately 40,000,000 cu. yds. of gravel in the Kurupung Fields, some 20,000,000 of which are potentially diamondiferous. The average thickness of the pay gravel is roughly 2.5 ft. The overburden is not less than 10 ft. and may be 20 ft. It consists of river deposits composed of 59 per cent clay, 34 per cent sand, and 7 per cent gravel. The ratio of overburden to pay gravel is not less than 4 : 1 and may reach 8 : 1. Webber believes that the minimum value per cu. yd. at which beneficiation could be considered is ⅛ ct. per cu. yd. of gravel. A profitable enterprise could be founded on ½ ct. per cu. yd.

Alluvial Diamond Mining

The company found that, in general, values of ¼ ct. or better per cu. yd. were erratic, and operations ceased. However, this was only one large-scale venture and others may be attempted. It also remains to be seen whether the high level alluvials could be exploited.

There is a possibility that alluvial diamond mining might be revived in the Marlissa area, upper Berbice River, if intensive prospection is carried out.

The small-scale individual miner will probably be driven eventually to prospecting on the inhospitable plateau. The authors of the report emphasize that it is quite impossible for diamondiferous alluvial deposits on the scale of the Mazaruni fields to be found in the Pakaraima Mountains. However, they do not dismiss the likelihood that small economic deposits may be discovered there.

(1) Bracewell, S., 1927; Report on the Preliminary Geol. Survey of the Potaro-Ireng District of Br. Guiana, Brit. Guiana Combined Court Annual Session. 1927.
(2) Webber, B. N., Progress Report on the Kurupung Diamond Field, Mazaruni District.

Selling British Mining Machinery in Canada

SOME three years have elapsed since the potentialities of Canada as an outlet for British mining machinery and equipment were underlined by the visit of a three-man mission from the Dominion to study the range of equipment available in this country and its suitability for Canadian needs. From the statistics available, it appeared that at that time Britain was supplying about 5 per cent of Canada's mining requirements, so that there appeared to be ample scope for British manufacturers to increase this dollar trade, a conclusion which was supported by enquiries from Canadian purchasing officers as to where their orders for equipment were normally placed.

The activities of the Dollar Council, the British Trade Commissioners in Canada, last year's Canadian Trade Mission, and other organizations in following up the possibilities indicated by the three-man mission have been the subject of various articles and reports in this journal, as have the special requirements of the Canadian market. (*Vide The Mining Journal*, 1/8/58, p. 120 ; 2/5/58, p. 499 ; 20/12/57, p. 739 ; 4/10/58, p. 389 ; 26/7/58, p. 104 ; 7/6/58, p. 715 ; 1/6/56, p. 671 ; 23/3/56, p. 360.)

During a recent visit to Canada the deputy editor of *The Mining Journal* had an opportunity of forming his own impression as to how far the time and effort devoted to expanding the sale of British mining equipment to Canada has been justified by the results so far achieved.

According to one source in close contact with the mining industry, growing interest on the part of British manufacturers is indicated by the fact that in recent months at least 12 firms formerly without representation in Canada have become established in that country. In this connection it was pointed out that, in view of the reduction in forward purchases by the National Coal Board, some of those British manufacturers who not long ago were fully committed are now in a position to bid for export business. Increased interest in British equipment on the part of Canadian purchasing agents is also reported.

Esteem For U.K. Equipment

Enquiries among leaders of the Canadian mining industry confirm the high esteem in which British equipment is widely held and the fund of goodwill which exists in the Dominion towards our manufacturers. The largest order recently placed with Britain appears to have been the purchase of two hoists valued at approximately $70,000 by a mining company which has had two of the same manufacturers' hoists in operation for nearly thirty years. It appears that in one or two instances orders which otherwise would probably have gone to Britain were placed elsewhere because quick deliveries were a prime consideration.

On the whole, the available evidence suggests that so far the success achieved in expanding our sales to Canada has not come up to expectations. It has been possible to obtain the figures for a representative cross-section of mining requirements, from which it will be seen that in most instances the proportion of the imports from Britain to total imports has shown little improvement, though useful increases have been accorded in quite a number of items. It will be noted that in several categories, e.g. alluvial mining machinery,

ore handling machinery, and power-driven pumps for mines, imports from Britain are conspicuous by their total absence.

It would be unfair to blame the British manufacturer for his failure to sell more equipment to Canada without recognising the difficulties which have arisen from circumstances entirely outside his control. For several years the Dominion has spent a higher proportion of its national income on the expansion and equipment of its mining industry than any other country. Mining in Canada, however, is very largely dependent on world demand and the impact of the American recession has led to the postponement or cancellation of many projects for the establishment of new mines or the expansion of existing producers. Resumption of the boom is no longer expected before next year or even 1960. Meanwhile, the number of plans for new metal mines which have been shelved for the time being may well run into hundreds.

Apart from the contraction in orders for capital equipment, British exporters have not been helped by the "Buy Canada" campaign, which has been carried on quite vigorously in certain industries, notably electrical engineering (Canadian industry is itself experiencing a recession). Many types of mining equipment are not made in the Dominion.

Combating Special Circumstances

It should also be realised that the British manufacturer wishing to do business with Canada is up against rather special circumstances, in as much as many of his U.S. competitors do not regard the Dominion as an export market, while many Canadian buyers do not think of American goods as imports. One of the effects of the recent deterioration in economic relations between the two countries, culminating in the U.S. quota restrictions on lead and zinc, has been to make Canadians more conscious that American products are essentially imported goods and this should be helpful to British exporters. By such reasoning, each satisfied user is a salesman for Britain. This is particularly true of the mining industry with its highly efficient bush telegraph, which rapidly spreads the news of efficient equipment and of good jobs done in good time.

The opportunity for expanding our business with Canada has certainly not been lost. It is evident, however, that in order to sell equipment to the Canadian mining industry—in competition with what in fact, if not in theory, is a very large domestic industry extending far beyond the Dominion's own boundary, British exporters must set up a branch or subsidiary in the Dominion to provide the technical selling, consultation during installation, and post-sales service. Alternatively they must have first-class agents. Many Canadian purchasing officers will not buy from U.K. firms unless they are established in Canada.

The other essential requirement is top priority for deliveries, which means putting Canada at the top of the export list. It is, of course, difficult—if not impossible—for a U.K. manufacturer exporting to a number of countries to follow the production schedule that suits a single customer. For firms which are prepared to spend time and money in gaining a footing in the Dominion and which can be competitive in their delivery times, the rewards should be well worth while, particularly when the seller's market for metals returns and the expansion of Canadian mining is resumed.

From these observations it would seem that export markets, like Rome, cannot be built in a day. In view of the considerable period likely to elapse from the time when a British manufacturer first becomes interested in the Canadian market to the delivery and installation of his first order, the accompanying statistics should be regarded as accurately reflecting the effects of a sales drive which had its genesis scarcely three years ago. They are, however, an impressive pointer to the opportunities ahead.

CANADIAN IMPORTS OF METAL MINING MACHINERY AND EQUIPMENT

Source — Dominion Bureau of Statistics
Trade of Canada — Imports
All figures are dollars.

Item	1955	1956	1957
5257	Locomotives, Sawmill, Mining		
U.K.	338,133	484,637	510,183
U.S.A.	1,905,647	2,522,897	3,033,496
Total All Countries	2,243,780	3,009,320	3,543,785
5462	Blowers, Smelting Apparatus		
U.K.	9,457	2,636	3,775
U.S.A.	343,151	742,919	1,022,915
Total All Countries	474,443	751,222	1,528,368
5464	Car Loading Machines, Coal		
U.K.	268	—	—
U.S.A.	7,368	8,605	13,360
Total All Countries	7,636	8,605	13,360
5467	Miners Lamps and Accessories		
U.K.	5,162	16,408	67,637
U.S.A.	306,753	456,496	560,377
Total All Countries	319,080	481,770	628,612
5470	Diamond Drills, Core Drills		
U.K.	297,302	544,886	726,192
U.S.A.	223,396	370,936	398,383
Total All Countries	522,320	920,980	1,130,838
5471	Mine Loading Machinery and Conveyors		
U.K.	834,984	2,922,014	1,096,544
U.S.A.	7,635,479	14,634,961	17,156,260
Total All Countries	8,506,315	17,639,069	18,314,550
5473	Machinery, Alluvial Mining		
U.K.	—	238	86
U.S.A.	1,957,925	1,288,863	1,549,129
Total All Countries	1,965,449	1,317,987	1,549,780
5474	Machinery, ore handling		
U.K.	—	—	—
U.S.A.	20,147	318	127,214
Total All Countries	20,147	318	127,214
5475	Machinery, ore concentration		
U.K.	233	4,529	3,329
U.S.A.	1,254,798	1,841,497	2,238,445
Total All Countries	1,260,061	1,847,062	2,243,202
5476	Machinery, metal refining		
U.K.	—	—	54,092
U.S.A.	124,221	122,556	134,812
Total All Countries	125,974	122,556	348,230
5477	Ore Crushers, Grinding Mills		
U.K.	18,705	79,053	30,869
U.S.A.	2,685,989	4,434,680	6,003,731
Total All Countries	2,795,035	4,536,828	6,265,859
5479	Power driven pumps for mines		
U.K.	—	—	—
U.S.A.	853	2,662	1,010
Total All Countries	853	2,662	1,010
5481	Rock drills and parts		
U.K.	100,043	149,714	234,635
U.S.A.	1,557,721	1,887,440	2,635,663
Total all Countries	2,739,923	3,009,563	3,242,487
5521	Air Compressing machinery and parts		
U.K.	322,520	654,016	986,401
U.S.A.	7,344,076	12,932,038	13,962,826
Total All Countries	8,015,116	13,954,739	15,377,688
5552	Cranes, etc. not made in Canada		
U.K.	117,454	236,095	290,212
U.S.A.	1,194,184	3,285,346	4,585,800
Total All Countries	1,366,089	3,646,113	5,062,716
5553	Cranes, etc. kind made in Canada		
U.K.	311,705	601,634	598,118
U.S.A.	4,322,895	7,604,072	7,183,736
Total All Countries	4,942,646	8,608,264	8,192,473
5554	Cranes, Hoists, etc., n.o.p.—parts of		
U.K.	185,610	342,851	424,009
U.S.A.	1,477,670	2,611,273	3,182,161
Total All Countries	1,731,861	3,009,528	3,737,973
6162	Switchgear for mines		
U.K.	49,168	54,332	28,034
U.S.A.	25,556	124,044	29,159
Total All Countries	74,724	178,376	57,193
9207	Miners' Rescue Appliances		
U.K.	18,862	18,079	15,727
U.S.A.	1,558,575	1,947,554	2,094,569
Total All Countries	1,579,461	1,975,539	2,123,827

Machinery and Equipment

An Effective Ore Sorting Device

On many occasions this journal has stressed the contribution made by personnel of the mining industry to the improvement of existing methods and techniques used in the industry. In this connection it is, therefore, pleasing to report that what is claimed as an "amazingly efficient" device for the elimination of waste rock from the feed to the mill has been developed at Bicroft Uranium Mines, Canada. Invented by two employees of the company, the K and H Electronic Sorter has recently been put into regular operation.

Handling only the plus 3 in. size material, the new sorter is expected to eliminate about 200 tons of waste from feed to mill. The benefits are obvious; first, the tonnage of waste eliminated allows for extra ore handling capacity at the mill, and second, each ton of waste prevented from entering the mill means a substantial saving in the chemical reagents that otherwise would be utilized.

The sorter was developed for use on uranium ores, but the same principles may be used in sorting other mill materials and it is expected that the machine will find wide application. Preliminary tests already concluded show that it is adaptable for sorting waste from gold ores, on a basis of colour difference, and the adaptation of the method to using the magnetic properties for sorting waste from ore is being studied.

The Northern Miner reports favourably on the speed and simplicity of the machine's operation. Indeed, several uranium mining companies are already reported to have evidenced interest in the machine and tests are to be made on ores from Blind River and Beaverlodge. Patents are pending.

In operation, the 3 in. oversize from the primary jaw crusher is thoroughly washed to remove fines clinging to the large pieces, which are then conveyed to sorting plant. Here they are fed on to a rotating disc whose purpose is to line up the individual pieces into single file. The disc discharges on to a belt, travelling 180 ft. per minute, which drops rock to the ore and waste bins. The sorting is done in the free fall from the belt.

The pieces, one by one, drop past a scintillation counter which measures the radioactivity of the individual piece. The decision is made, electronically, as to whether the piece is ore or waste. This information is stored in an electric brain for the fraction of a second that it takes the piece of rock to fall 18 in. to a point opposite three air jets. A powerful blast of air from these jets blows the rock so that it falls into the waste bin. If the piece is ore it is allowed to fall straight down into the ore bin.

The length of time that the air jets are open varies with the size of the rock so that larger pieces get a longer blast of air. The air jets can blow 40 times a second so that theoretically they could direct 40 pieces of waste rock per second into the waste bin. Actually, with the individual pieces 3 in. in size not more than seven pieces per second will drop past the air jets. Acceleration, due to gravity, keeps the pieces well separated even though they may have been touching the piece behind at the time it dropped over the end of the belt.

At Bicroft, about 70 per cent of the plus 3-in. material is waste and 30 per cent is ore. Thus, of the material fed through the sorting machine, about two pieces of waste are discarded for every piece of ore. By discarding waste, any errors that are made are on the positive side. That is, if the machine should fail the feed would drop through into the ore bin and no valuable material would be lost. The K and H handles 20-25 tons per hour of about 3-in. size material. With larger pieces the capacity would be about 35 tons per hour.

Chemical assays indicate that the waste discarded is grading as low as 0.005 per cent U_3O_8.

A new spring-mounted oscillating front axle is standard on the ¾-yd. Lorain Self-Propelled Model SP-107 and allows the front wheels to hug the ground so the 4-wheel drive can apply the tractive effort necessary to carry this rubber-tyre excavator over rough terrain

LOW-SEAM SHUTTLE CAR

A six-wheeled, low-seam shuttle car has been announced by Joy Manufacturing Co., United States. Called the 18-SC, the car is 27 in. high and carries 4½ tons of coal at 3.5 m.p.h. It is said to empty a full load in 27 sec.

The reason for the car's high capacity lies in its unique six-wheeled design which permits an extra-large fixed height conveyor 6 ft. wide and 27 ft. long. On four-wheeled shuttle cars, increasing car capacity necessitates increasing the size of the wheel units for proper weight distribution and load bearing. This in turn requires larger wheel wells resulting in less usable payload space. To eliminate this space problem while maintaining good load characteristics, Joy engineers added another wheel to each side of the car, while reducing the overall size of each wheel unit used.

These additional wheel units are centrally located on each side of the car and are used for the traction drive. Each wheel is driven independently of the other by a 10 h.p. motor through a speed reducer, chain and sprocket, eliminating transmissions and differentials.

For maximum flexibility under all conditions the 18-SC is hinged the width of the car near the traction wheels. When climbing up and down small rises and depressions the car bends in the middle, keeping the wheels in contact with the ground. This hinged design also permits running the discharge end of the car up a ramp when an elevated discharge is desired.

The two wheels in front and those in the rear employ a pivot mounting which enables the car to remain level while negotiating a banked or slanted bottom. This pivot suspension permits the wheels in front to tilt in one direction while the rear wheels tilt in the other. The result, it is claimed, is that the 18-SC can negotiate the roughest bottom quickly and easily without load spillage.

ELECTROGYRO LOCOMOTIVE

An electrogyro locomotive which derives its power from two large flywheels has been developed by the National Coal Board. The flywheels rotate at speed to store energy then converted into electrical power used to drive the locomotive. Surface trials were held on this new type of shunting locomotive at Northumberland recently.

The operating principle in use is an electrical charge supplied from a contact mast and through two induction motors. These start the flywheels storing kinetic energy. The reverse happens when the locomotive moves. The stored energy is drawn off in the form of electric power by the two traction motors which turn the road wheels.

In order to speed the gyros for 30 minutes' operation, 2½ minutes are required, corresponding to the normal haulage duty needed in the mining industry of a short run followed by a stop. The

construction of an underground gyro might be a possibility should the equipment prove technically and economically sound.

SOUTH AFRICAN SHAFT SINKING GRAB CARRIAGE

A novel form of shaft sinking carriage for vertical circular shafts has been developed and is in use at Hartebeestfontein Gold Mining Co. Ltd., South Africa. The carriage was designed to impart vertical, radial and circumferential movement hydraulically to a pneumatically-operated Cactus type grab of up to 30 cu. ft. capacity.

The new carriage was designed for a loading rate of 120 tons an hour using a 20 cu. ft. grab. In practice, the capacity is in the range of 90-150 tons an hour according to the nature of the broken rock.

Circumferential traverse is at a rate of two revolutions per minute and the vertical movement is at 60 ft. a minute. A complete loading cycle is achieved in about 25 seconds.

A universal joint couples the grab to a clevis which is screwed to the piston rod of a lifting cylinder. The lifting cylinder is suspended from a trolley located within the horizontal boom of the grab carriage, and a universal joint couples these two components. Traverse of the trolley is by means of a boom cylinder located within the boom which, itself, is fixed to the underside of an inner box operated vertically within an outer box.

The smooth travel of the inner box within the outer box is achieved by means of rollers which are fixed to the inner box. Vertical movement of the inner box is by means of a telescopic box cylinder which has a stroke of 7 ft. The telescopic box cylinder is hinged to the top cover of the outer box and the piston rod of this cylinder is screwed to a clevis which is fixed around channel irons forming the boom which, in turn, is integral with the inner box.

On the top of the outer box there is fixed a rotary gland which is designed to permit of rotary movement in relation to the fixed air and water lines.

Air and water supplies and exhaust pipelines are connected from the rotary gland to air and water manifolds respectively, which are fixed to the outside of the outer box. These reversing valves are connected to the water manifold to operate the grab-lifting cylinder, boom cylinder and telescopic box cylinder.

There are also connected to the air manifold two similar control valves to operate the air motor and grab.

The grab carriage is located centrally in the shaft. The trolley from which the grab-lifting cylinder is suspended has a horizontal travel of 4 ft. 6 in. starting from a point 4 ft. 11 in. from the axis. In conjunction with the rotary movement of the boom this arrangement enables a grab having a diameter of 7 ft. 6 in. when open to cover a circular area of 26 ft. in dia.

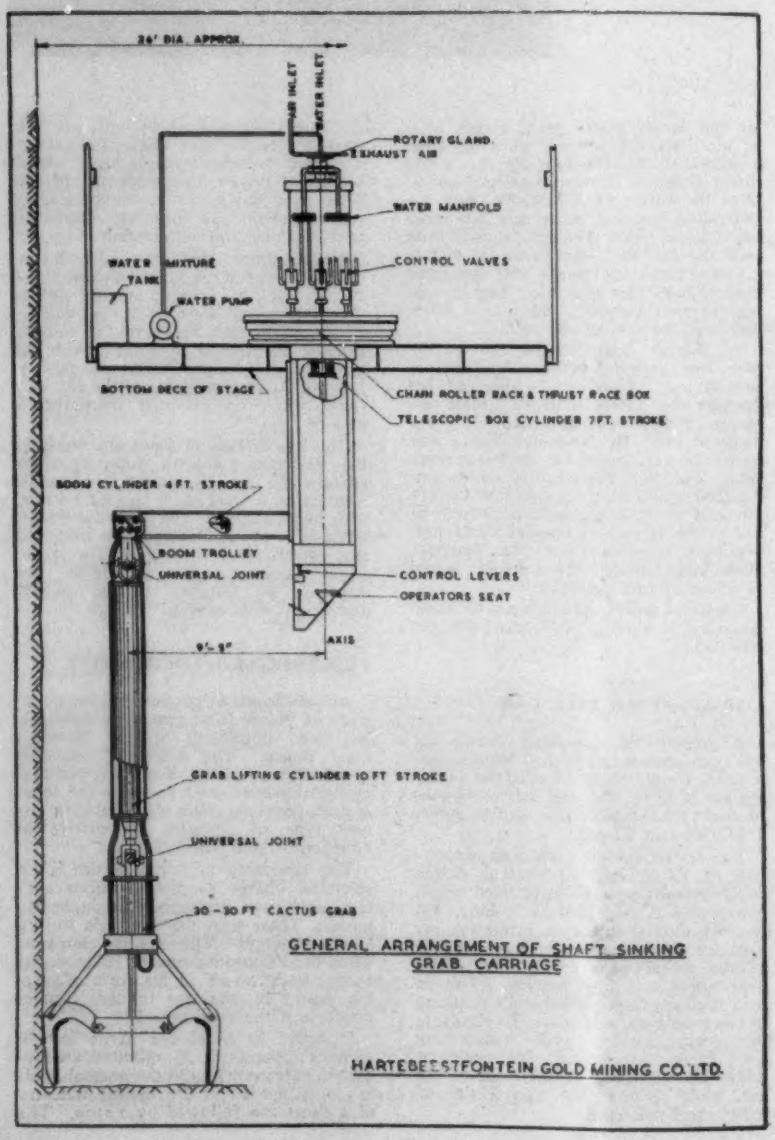
The total vertical lift is 17 ft., made up of a 10-ft. lift provided by the grab-lifting cylinder and a further independent lift of up to 7 ft. provided by the telescopic box cylinder operating the outer box.

All motions of the carriage and Cactus grab are controlled from a cockpit fixed to the bottom of the outer box.

The hydraulic pressure pump, driven by a 50 h.p. air motor, is situated on the bottom of the stage and delivers 12,000 galls. per hr. of fluid at a pressure of 300 lb. p.s.i. The pump and the various hydraulic cylinders are connected in closed circuit with a supply tank placed adjacent to the pump.

The approximate overall length of the carriage in its maximum lift position is 26 ft. measured from the end of the clevis connecting the grab-lifting cylinder and the grab to the top of the rotary gland. The portion protruding above the bottom deck of the stage measures approximately 10 ft. 6 in.

All components of the grab carriage are readily changed or dismantled *in situ*, and all internal operating mechanisms are accessible through inspection covers.



AUTOMATION IN MINING

The plant at Dnepropetrovsk, which has for some time been producing selenium rectifiers, has just begun the production, it is claimed, of several new types of automatic equipment for the Soviet mining industry.

Improved automatic devices for dust extraction at dressing mills have undergone tests in the plant's experimental shop. They automatically switch off and on hydraulic installations which absorb ore dust as required. It is also claimed that many coal mines have been equipped with a new control relay for scraper conveyors. They use hermetically sealed transistors—which means they have a longer life—and exercise a reliable control over the operation of underground machinery. Should breakdowns or any other irregularities occur, signals are automatically sent to the despatchers.

New daylight lamps—with a superior performance and less weight than the old types—and automatic equipment for controlling the working of mine hoists are also being manufactured at the Dnepropetrovsk plant.

MINING MISCELLANY

The production of crude mica in India, 1957 to 1958, was estimated at 555,000 cwt. The exports of mica during the same period amounted to 430,000 cwt.

★

Copies of the draft of the new Bolivian Mining Code have been distributed for detailed criticism to prominent persons in Bolivian universities, Chambers of Mines, and other bodies connected with mining, the National Planning Commission, and legal and juridical institutions throughout the country.

★

The Government of the Federation of Malaya still regards the location of Malaya's uranium deposits as confidential. The radioactive material was found in 1955 in a jungle-covered abandoned tin mine within ten miles of the mountain holiday resort of Fraser's Hill. Commenting on a statement that the government had not as yet approved an application from one of the biggest mining companies in the Federation to prospect for uranium, a spokesman of the Mines Department of Malaya said that the issue of prospecting permits was entirely a government matter.

★

New lead deposits have been discovered in Central Kazakhstan, Soviet Central Asia, which lie near the earth's surface. The new discoveries, together with others made in the area during the last few years, make Kazakhstan a lead-producing area as important as the Altai, hitherto the main producer of lead in the Soviet Union.

★

Mr. Rex L'Ange, the Parliamentary Secretary to the Federal Ministry of Transport and Works, believes that the Federation of Central Africa should be the show-window for the uses of processed copper. To show his visitors one use of copper, he has had the inside of his office door covered with beaten copper foil, costing about 144s. for 100 sq. ft., or about 1s. 6d. a sq. ft. At present, the only processing of copper in the Federation is wire-drawing. Mr. L'Ange said he would like to see the Federation have a processing industry. The use of Kariba electrical power should make this possible.

★

A German company is considering the construction of a copper plant in the State of Ceara, using Brazilian ore.

★

In the annual report of the parent company, Potash Co. of America, it is revealed that some production can be expected before the end of this year from the potash properties near Saskatoon, Saskatchewan, of the Potash Co. of America Ltd. It may be early spring of 1959, however, before full production is achieved. The plant should be ready for commissioning well before the November target date, and it will then be available for test operations, while the mine is being developed for large-scale production.

★

New Mylamaque Explorations, of Montreal, Canada, is one of several companies negotiating for the use of the Strategic-U.D.Y. process for direct reduction of iron ore to pig iron or semi-steel. New Mylamaque's titaniferous iron ore-body is located thirty-two miles north of Kingston, Ontario, on the St. Lawrence River. Power lines cross the property and would provide cheap electricity. There is also an abundance of limestone, necessary for processing. The new management who took over the company recently contemplate using plant costing $15,000,000 to $17,000,000, which would handle 3,000 to 4,000 tons of ore daily, and produce 1,000 tons of pig iron daily.

★

A rich nickel ore deposit has been discovered near Beconsfield in Northern Tasmania, a Labour member for Tasmania has disclosed in the Australian House of Representatives. The member, Mr. G. W. Duthie, appealed for Commonwealth aid to develop the field, which, he said, was estimated to contain nickel worth £A22,000,000 and which could supply Australia for the next forty years.

★

Camp Bird Mining Ltd. has turned over five groups totalling eighty claims in the Grasset Lake sector, Mattagami area, to Noranda Mines Ltd. for further investigation. The groups, located within a radius of a few miles in Subercase and Ste. Helene townships, cover anomalous areas situated in airborne and ground geophysical surveys. It is understood that Camp Bird would have the opportunity of participating in the development of any discoveries on these groups.

★

It was announced at the annual meeting of the British Newfoundland Corporation that the Corporation's exploration programme will be continued over the five years to 1963 at a cost of $1,250,000 in order to keep alive the Corporation's mineral concessions.

★

The McNally Pittsburgh Manufacturing Corporation, United States, manufacturer of coal washing plants, is to invest a further £A250,000 in A. E. Goodwin Ltd., a Sydney engineering company, to expand the Australian manufacture of coal improvement plants.

★

Austria is considering the introduction of a special duty on imported coal. According to the Austrian Chamber of Commerce, the decreasing prices on the international coal market have led to growing competition from the Austrian coal mines. Upon requests by the Austrian Mining Association, special protective taxes of 5 sch. (Aust.) per tonne of imported hard coal and coke, and of 2.50 sch. (Aust.) per tonne of imported soft coal, are now being considered. The revenues accruing from this special duty are to be used for subsidizing the Austrian coal industry.

★

Mainland China and North Korea have signed a trade pact in Peking covering the exchange of goods between the two countries from 1959 to 1962. Under the agreement, China undertakes to supply coal and other goods in return for North Korean iron ore, copper, lead, zinc, and other materials.

★

A new borax deposit has been formally inaugurated at Emet, Turkey. It is to be exploited by the Eti Bank. A number of deposits have been discovered in the area during recent years.

★

At Kuala Juru, opposite Penang Island, in the Federation of Malaya, on September 29, was launched the pontoon for a new sea dredge being constructed by the Mechanical Engineering Department of Anglo-Oriental (Malaya) Ltd. for the Tongkah Harbour Tin Dredging Ltd. The pontoon is 250 ft. in length, 72 ft. wide, 11½ ft. deep, and weighs 850 tons. It has taken six months to complete. The new dredge, when commissioned, will have a bucket band of 15 cu. ft. buckets and will be capable of digging to 100 ft. below the sea level. The deadweight will be 2,700 tons. Certain parts of an old dredge which operated in Patani, on the east coast of Thailand, are being used in constructing the superstructure of the new dredge. The old dredge, after dismantling, was conveyed by the Royal Thai Railways and the Malayan Railway to the construction site, a disused quarry, on the west coast of Malaya. It is anticipated that another twelve months will be required before the dredge is ready for towing to its operational site in Tongkah Harbour, Phuket.

The hull of the new sea-dredge of Tongkah Harbour Tin Dredging Ltd., after its successful launching

off the west coast of Thailand. The estimated total cost of the sea dredge is $M3,500,000.

★

The International Co-operation Administration announced in Washington that the South American Gold and Platinum Co. had received a guarantee from the United States Government covering the company for up to a maximum of $U.S.3,000,000 against any loss on its investment in gold dredging activities in Bolivia, as a result of expropriation. A large part of the company's investment will be for the purchase of a large dredge which will have to be transported piecemeal by air to the inaccessible areas near the upper Beni river, where the company will be operating.

★

The Ceylon Government Railway has complained to the Chinese government that the Chinese coal it has been receiving is accompanied by large quantities of dust, and that the railway employees find it very difficult to work with such fuel. It is pointed out that the dust gets into the fuse box when the coal is stocked, and very often engine failures occur.

★

On September 26, a large area embracing important tin mines in the Tronoh and surrounding district of Malaya were declared to be free of Communist terrorists, and all emergency restrictions were lifted. This declaration was followed on September 27 by the easing of emergency regulations in another major tin mining district in South Perak, around Tapah and Batang Padang. Although this latter area is not yet officially considered to be entirely free of terrorists, the menace is sufficiently reduced to permit the relaxation of a number of restrictions. Both the areas concerned have been amongst the worst Communist-infested parts of the Federation.

PERSONAL

Mr. B. D. Bowman, B.Sc.Eng., A.M.I.Mech.E., is joining Metaducts Ltd., manufacturers of flexible metallic power transmission equipment and "Metastream" couplings, as technical sales manager.

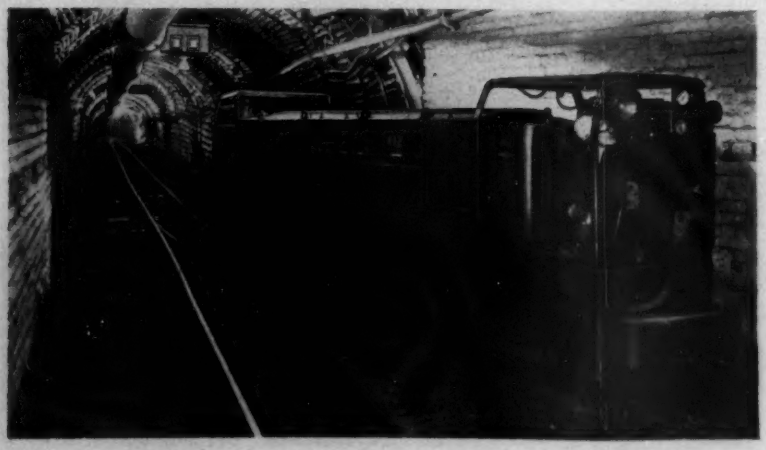
Inspecting a 10 ft. length of sand suction hose, 23 in. dia., with internal armouring is Mr. R. MacLellan, joint managing director of George MacLellan and Co. Ltd., Maryhill, Glasgow. The hose is one of a series being manufactured by the company for a New Zealand Authority. With Mr. MacLellan is Mr. David Johnstone. They recently left on a 20,000 mile sales trip through Canada and the United States

Mr. A. H. Tandy, C.B.E., United Kingdom representative to the European Coal and Steel Community, has presented his credentials to the Commission of the European Atomic Energy Community in his new role as United Kingdom representative to Euratom. Mr. Tandy succeeds Sir William Meiklereid, K.B.E., C.M.G., who has retired from the Foreign Service.

★

The board of Harrisons and Crosfield Ltd. have invited Mr. H. O. Peake to become life president of the company. Mr. Peake was appointed a director in 1919, and in August of this year he completed fifty years' service with the company.

A recent order placed with Metropolitan-Vickers Electrical Co. Ltd. by the National Coal Board (East Midlands Division) is for a flameproof battery locomotive for Markham Colliery, near Chesterfield. The locomotive, a Metropolitan-Vickers Type DBF/12, will be used chiefly for hauling man-riding carriages and material trains over the 2-ft. gauge lines, involving gradients of 1 in 21.2. The illustration shows a locomotive of this type in service



CONFERENCES AND EXHIBITIONS

The theme of the British Institute of Management, National Management Conference, 1958, is to be "The Challenge of Change". The conference will be held at Brighton from November 26 to November 28, and will be attended by 1,000 delegates.

★

The annual general meeting of the North of England Institute of Mining and Mechanical Engineers will be held in the Lecture Theatre, Neville Hall, Newcastle upon Tyne, on October 11.

CONTRACTS AND TENDERS

Formosa

One Scraper, 120-180 engine belt horse-power Diesel Engine, 5 forward speeds, top speed not less than 20 m.p.h. Issuing authority, Central Trust of China, Purchasing Department, 68 Yen Ping Nan Road, Taipei, Taiwan. Closing date, October 17, 1958. Ref. E.S.B. 24342/58. Telephone inquiries to Chancery 4411, extension 738 or 771.

Formosa

Diamond Bits and Core Drilling Rods, 1 lot. Wagon Drill Rods and Bits, 1 lot. Water Level Recorder and Accessories, 1 lot. Issuing authority, Central Trust of China, Purchasing Department, 68 Yen Ping Nan Road, Taipei, Taiwan (Formosa). Closing date, October 31, 1958. Ref. E.S.B. 23999/58 I.C.A. Telephone inquiries to Chancery 4411, extension 354.

★

Baldwin-Lima-Hamilton Corp., of the United States, has stated that its Eddystone division have received a $2,000,000 order for eighty-five railroad ore cars from Southern Peru Copper Corp., of New York. The side-dump cars, with a capacity of 90 tons, will be used to transport copper ore from Southern Peru's Toquepala mine, near Ilo, Peru, to an ore concentrator.

Metals and Minerals

Russian Assurances on Aluminium

The Board of Trade disclosed at the end of last week that it would take no further action on Alcan's request for a British anti-dumping duty on Soviet aluminium. The B.O.T. has felt able to do this on the basis of an assurance from Raznoimport, the sole Soviet aluminium exporter, that Russia would not export more than 15,000 tons of aluminium to this country over the next twelve months. This is approximately the average rate which has been maintained since the beginning of 1957, although, of course, prior to that imports from Russia were very small.

In the face of this assurance Alcan can scarcely quarrel with the Board's decision, especially in the light of the energetic plea for free trade in aluminium put forward by Mr. Nathanael V. Davis in a speech reported here last week.

Nevertheless, the enigma of Russian policy over commodity exports in general remains.

Apart from its general desire to foster trade with the U.S.S.R., the Board of Trade will not have forgotten its recent experiences with Russian tin sales. When dealing with an international commodity, to exclude Russian exports from one European country does not ensure its exclusion from the Western economic system. True, there is not quite yet the same international market flexibility in aluminium that there is in the L.M.E. metals, but even so surplus aluminium in any western country will tend to find its way into Britain if the price is made sufficiently attractive.

Russia's recent assurances on the subject of aluminium take us little nearer towards identifying the real motive behind Russia's commodity export policy. If the policy is one of deliberate economic aggression, it is not apparently being conducted with great tenacity, although the timing has often been shrewd. If, on the other hand, these exports are essentially commercial operations, do they reflect a scaling down of strategic stockpiles in consequence of some reassessment of long-term defence requirements, or do they represent immediate short-term surpluses which are more conveniently traded for imports than held against future expanding industrial requirements? In the former case, we should expect to see Russian metal exports dwindling again in the fairly short term. In the latter, we must expect these sporadic excretions from the Russian economic system to continue. Incidentally, if the latter explanation is accepted, it must be inferred that Russian gold stocks are not as large as some of the more extravagant estimates would suggest. If the Russians had got gold running out of their ears, they would scarcely requite their imports with industrially valuable minerals, even if these were in temporary surplus.

The more buoyant outlook for American economy is reflected in Alcoa's announcement that it is to restart one of its idle potlines at its Point Comfort smelting works in Texas, together with the introduction of a new line at its Messena plant in New York State. These new facilities will be partially offset with the closing of two obsolete small capacity potlines. It is also reported that Reynolds Metals is returning to full production at its reduction plant at Troutdale, Oregon.

*

Following French Guinea's decision to opt out of the French Union, there has been some speculation as to the effect this may have on its bauxite and alumina projects. Two main groups are developing this industry in Guinea—the international consortium of French, British, American, and Swiss interests, called Fria, and the Bauxites du Midi, a French subsidiary of Alcan. The first group is already heavily committed financially, and expects eventually to be producing about 500,000 tons of alumina, with further plans to double this capacity. In any case, this project is probably too far advanced to be substantially revised, but it has been rumoured in Paris that the Alcan project (originally intended to produce an initial annual output of 220,000 tons of alumina a year at Boke) may be delayed for the time being.

Plans to produce aluminium in the territory may also receive a setback. These were dependent on the establishment of a hydroelectric dam on the Konkoure River. Prior to Guinea's independence, the French Government had asked the World Bank for a loan to help finance this project in collaboration with several of the big producers. What view the World Bank will now take of this investment remains to be seen.

Another interesting factor in the new situation may be seen in the friendly advances made by Dr. Nkruma to the new State. The development of any close economic ties between Ghana and Guinea might open the way for a re-appraisal both of the hydroelectric and aluminium potential of these relatively adjacent areas.

LONDON METAL AND ORE PRICES, OCT. 9, 1958

METAL PRICES

Aluminium, 99.5%, £180 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £190 per ton
Crude (70%) £190 per ton
Ore (60%) bases 19s. 6d./20s. 6d. nom. per unit, c.i.f.
Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 9s. 6d. lb.
Cerium (99%) net, £16 0s. lb. delivered U.K.
Chromium, Cr. 99% 6s. 11d. lb.
Cobalt, 16s. lb.
Germanium, 99.99%, Ge. kilo lots 2s. 5d. per gram.
Gold, 250s. 4¼d.
Iridium, £20/£22 oz. nom.
Lanthanum (98/99%) 15s. per gram.
Manganese Metal (96% - 98%) £290
Magnesium, 2s. 5½d. lb.
Nickel, 99.5% (home trade) £600 per ton
Osmium, £17/£18 oz. nom.
Osmiridium, nom.
Palladium, £5/£5 15s.
Platinum U.K. and Empire Refined £21 5s. oz.
Imported £18 15s./£19 15s.
Quicksilver, £79 0s. ex-warehouse
Rhodium, £40/£42 oz.
Ruthenium, £14/£16 oz. nom.
Selenium, 50s. 0d. per lb.
Silver, 77¼d. f. oz. spot and 77¾d. f'd.
Tellurium, 15s./16s. lb.

ORES AND OXIDES

Bismuth		65% 8s. 6d. lb. c.i.f. 18/20% 1s. 3d. lb. c.i.f.
Chrome Ore—		
Rhodesian Metallurgical (semifriable) 48%	(Ratio 3:1)	£15 15s. 0d. per ton c.i.f.
" Hard Lumpy 45%	(Ratio 3:1)	£15 10s. 0d. per ton c.i.f.
" Refractory 40%		£11 0s. 0d. per ton c.i.f.
" Smalls 44%	(Ratio 3:1)	£14 0s. 0d. per ton cli.f.
Baluchistan 48%	(Ratio 3:1)	£11 15s. 0d. per ton f.o.b.
Columbite, 65% combined oxides, high grade		nom.
Fluorspar—		
Acid Grade, Flotated Material		£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF_2)		156s. 0d. ex works
Lithium Ore—		
Petalite min. 3½% Li_2O		40s. 0d./45s. 0d. per unit f.o.b. Beira
Lepidolite min. 3½% Li_2O		40s. 0d./45s. 0d. per unit f.o.b. Beira
Amblygonite basis 7% Li_2O		£25 0s. per ton f.o.b. Beira
Magnesite, ground calcined		£28 0s./£30 0s. d/d
Magnesite Raw (ground)		£21 0s./£23 0s. d/d
Manganese Ore Indian—		
Europe (46% - 48%) basis 55s. 0d. freight		83d./85d. per unit c.i.f. nom.
Manganese Ore (43% - 45%)		70d./75d. per unit c.i.f. nom.
Manganese Ore (38% - 40%)		50d./54d. per unit c.i.f. nom.
Molybdenite (85%) basis		8s. 5d. per lb. (f.o.b.)
Titanium Ore—		
Rutile 95/97% TiO_2 (prompt delivery)		£35/£36 per ton c.i.f. Aust'n.
Ilmenite 52/54% TiO_2		£11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%)		60s. 0d./65s. 0d. per unit c.i.f.
Vanadium—		
Fused oxide 95% V_2O_5		8s./8s. 11d. per lb. V_2O_5 c.i.f.
Zircon Sand (Australian) (65 - 66% ZrO_2)		£13 0s. per ton c.i.f.

TITANIUM PRICE CUT

For the second time this year, Dupont have cut their titanium metal sponge prices. With effect from the beginning of this month, Grade A-1 sponge is reduced from $2.05 to $1.82 per lb., and Grade A-2 from $1.85 to $1.70—both quotations for minimum 100 lb. lots f.o.b. Newport, Delaware. Price reductions in this metal are, of course, a reflection of falling production costs side by side with expanding production, together with the need to get the metal on to a competitive basis in the search for new uses. Already in less than five years the price has come down from a level of $5 to the present quotation, and it is thought that within another five years titanium metal might well be selling at 30 to 50 per cent below present prices.

MORE DIAMONDS FOR STOCKPILE

The G.S.A. has announced a further purchasing programme for the national stockpile, covering mounted and unmounted industrial diamond dies in sizes ranging from below 0.0002 up to 0.0007. At least 50 per cent of the purchases are to be of "domestic" origin, i.e. manufactured entirely within the States. No indication is given of the quantities likely to be bought.

INCO'S STOCKS

A recent statement by International Nickel in connection with their present labour strike has incidentally brought out an interesting fact regarding the extent to which the company is insulating the market from the present considerable overproduction. It appears that at the commencement of the strike Inco's stocks of unsold nickel amounted to 75,000 tons, or nine months' production at their present reduced rate of output, which at Sudbury is currently less than two-thirds of normal capacity. Inco is thus being notably consistent in its long declared policy of stabilizing prices. The company did not take advantage of the consumer during the extreme shortages of recent years, and can thus scarcely be criticized for its current production cuts and stockpiling. Indeed the latter provides further insurance that the user can now freely design nickel into his products without fear of future shortage.

THE OUTLOOK FOR WOLFRAM

Although London wolfram quotations remain unchanged, more business has recently been done than for some time past. The effect of this appears to have been seen mainly in some reduction in European stocks, as producers are still disinclined to sell at present price levels. There are further reports of mine closures in Bolivia and the United States, the few mines still producing in the latter country having, of course, suffered a further setback through the defeat of the Minerals Stabilization Bill.

In this connection, the market must be awaiting with some misgivings further news of the proposals now circulating in Washington for a full-scale investigation into the desirability of placing import restrictions on tungsten, and incidentally on cobalt, too.

COPPER · TIN · LEAD · ZINC

(From Our London Metal Exchange Correspondent)

After the fairly sharp rise in the prices of all four metals towards the end of last week, a certain hesitancy has now developed, which is not surprising and is looked upon as being mainly a period of consolidation. A further development has been the establishment of a backwardation in all four metals, which in the cases of copper and tin is generally attributed to the fact that existing stocks are now almost all held in very firm hands. In the cases of lead and zinc it is attributable to demand for nearby metal, possibly in connection with the recent imposition of quotas into the U.S.A.

COPPERBELT STOPPAGE CONTINUES

Demand for copper has showed an improvement both in the U.S. and in Europe and this, combined with strength on Wall Street and on Comex, has led to higher prices all round. With copper scrap very firm the U.S. customs smelters raised their price by 0.5 c. per lb. to 27 c. per lb., and then subsequently to 27.50 c. per lb., although producers have maintained their old price level of 26.5 c. per lb. The Belgian producer has raised his price in two stages to the equivalent of approximately 28.35 c. per lb., New York or Antwerp, while on the metal exchange, prices also show a substantial increase, but there has been certain hesitancy pending the result of the negotiations now in progress towards the settlement of the strike in Rhodesia. These appear for the moment to have again broken down.

Phelps Dodge have now followed the example of Kennecott and increased their production from a five-day schedule to one of five and a half days per week, and it is expected that Anaconda will follow suit in the near future. The strike in Rhodesia continues, and the majority opinion is that should it not be settled within the next few days a shortage of copper may very well develop in Europe later in the year. To rectify this the London price will have to go to a sufficient premium over the American quotations to enable copper to be shipped from west to east across the Atlantic. It will be interesting to see how ready American stockholders will be to take a profit.

Stocks in official warehouses continue to fall and now stand at 9,899 tons, a fall of 632 tons from the previous week and the development of a backwardation seems to indicate that these stocks are firmly held.

EASTERN PRICE WEATHERS START OF QUOTA PERIOD

The tin market is still in a period of re-adjustment and both turnovers and price movements have been small. The behaviour of the Singapore market at the beginning of the month was a factor for strength as the expected heavy offerings did not take place! However, it is understood that the daily turnover did show a considerable increase. This was easily absorbed by better consumer demand throughout the world.

The latest figures of shipments from Malaya cover the month of September, and these show that during that month shipments from Singapore totalled 368 tons, a little more than a third of the August figure of 903 tons. Shipments from Penang were also lower at 2,387 tons against 3,103 tons for August. It is interesting to note that again in both cases there were no shipments to the U.K. or U.K. options.

Shipments of tin in ore from Indonesia during August totalled 1,427 tons of which the bulk was destined for London options and a small tonnage for Holland; this compares with a figure of 884 tons in July, all of which were shipped with London options.

The Eastern price on Thursday morning was equivalent to £752½ per ton c.i.f. Europe.

WAITING AND SEEING

The first results of the imposition of import quotas into the United States for lead and zinc have been an advance in the quotations in America for both metals, and the establishment of a backwardation on the L.M.E. accompanied by a price rise. This latter, however, is not considered by the majority of dealers to be permanent. The undertone in both markets is uncertain and is likely to remain so until prospects of some kind of cutback in production become better. It must be said here that the London Metal Exchange hopes that the normal law of supply and demand will bring about such a state of affairs rather than some keenly negotiated international agreement.

As opposed to recent weeks, the lead market has become the better of the two owing to a demand for nearby metal which, it is understood, is destined for America. The zinc market, on the other hand, is having to contend with fairly constant sales of forward metal which is probably connected with the practice of certain European smelters over recent months of having guaranteed a zinc price for their intake of raw materials.

It cannot be said that there are any signs of an appreciable pick-up in commercial demand for the two metals, although in the States attention has been drawn to the better requirements of zinc. The still unsettled state in the automobile industry is still having a restraining effect. In spite of this the prices of both metals have been raised in two stages by 1.00 c. per lb., making the present quotations for lead 12.30 c. per lb. and for zinc 11.50 c. per lb., both delivered East St. Louis.

The latest lead figures issued by the U.S. Bureau of Mines cover the month of July and show that although primary refiners' production of lead was 11 per cent lower than in June, this was still more than was shipped to consumers during the month and stocks of refined lead rose totalling 154,400 s.tons on July 31. Consumers are estimated to have used 80,500 tons in July, which showed little difference from the June figure, and stocks of metal at consumers' plants and at secondary smelter plants decreased during the month by some 7 per cent.

Closing prices are as follows:

	Oct. 2		Oct. 9	
	Buyers	*Sellers*	*Buyers*	*Sellers*
COPPER				
Cash ..	£213¼	£213½	£227	£228
Three months ..	£213¼	£213½	£222½	£223
Settlement ..	£213½		£228	
Week's turnover	6,575 tons		11,075 tons	
LEAD				
Current ½ month	£71½	£71½	£71	£71¼
Three months ..	£72¼	£72½	£72¼	£72½
Week's turnover	6,300 tons		7,150 tons	
TIN				
Cash	£729½	£730	£738	£739
Three months ..	£721	£722	£732	£733
Settlement ..	£730		£739	
Week's turnover	580 tons		605 tons	
ZINC				
Current ½ month	£66½	£66½	£67½	£67½
Three months ..	£66½	£66½	£66¼	£67
Week's turnover	7,150 tons		7,650 tons	

London Metal and Ore Prices appear on page 395.

Mining Finance

The Strength of Southern Kinta

Southern Kinta is one of the mines whose names are always mentioned in a discussion of the two elements essential to a mining share at the present difficult time — flexibility, as exemplified by a large number of dredges, and a strong financial position.

The value of these two elements in practice is revealed by a study of Southern Kinta's report for the twelve months to March 31 last. Although only the first—and least stringent—of the quota periods falls inside the financial year, buffer stock contributions were being called throughout, and the chairman's statement appended brings the picture almost up to the present time. The whole therefore provides a useful account of how the industry's difficulties are being met, at least by those units with sufficient resources to re-deploy.

The financial strain imposed by buffer stock contributions obviously admits of no counter-measures. Either the company concerned has persevered in building up the "excessive" liquid position which was so derided in some quarters two years ago, or it has not. In the case of Southern Kinta, net current assets at the beginning of the 1957-58 financial year stood at over £1,500,000 (as, in fact, they still do), so that further contributions of £78,000 to the buffer stock could be met with equanimity in spite of the inevitable drop in profit from £1,181,796 to £831,139.

On the technical side, the way in which Southern Kinta's dredge fleet has been deployed is probably typical of Malaya's multi-dredge concerns. All told, Southern Kinta owns nine dredges of varying sizes and efficiencies, working six areas of varying grade and difficulty.

When in January, 1958, the effects of output restriction began to be felt, the Kampar Malaya No. 1 dredge was closed down. This dredge had produced 208 tons of tin in 5,800 hours' working, and was thus uneconomic compared with the No. 2 dredge on the same section, which produced 459 tons from 7,243 hours. Later this year, the Kinta Nos. 1 and 2 dredges were closed, No. 1 partly for reasons similar to the Kampar Malaya closure, but both because the Kinta river deviation could thereby be expedited.

Thus Southern Kinta is in a position to fulfil its quota by working six of its most efficient dredges, while at the same time a necessary river deviation can be carried out (with, in the circumstances, no loss of output) against the time when tin production is freed.

A contrast is provided by the unhappy news from two smaller producers, Hongkong Tin and Kent F.M.S. Both mines are to close down for the time being, it apparently costing less to sell the quota and maintain the dredge than to go on producing at present quota levels.

TANKS' PRELIMINARIES

The year to July 31 last is the first in which Tanganyika Concessions feels the effect of the drop in copper prices. Tanks' accounts inevitably have a time-lag element in that the two chief sources of income, the Union Minière du Haut Katanga and the Benguela Railway, both end their financial years on December 31. Thus although the price of copper at July, 1957, was down to £215, the accounts reflected a year when the average price for the metal was £329. Similarly, this year's accounts deal with profits largely earned during 1957, when copper averaged £219, although from January to July, 1958, the price was rarely as high as £200.

Another factor making it necessary to exercise caution when comparing one year's results with another is the distribution policy of the Benguela Railway. For several years past this wholly owned subsidiary of Tanks has augmented its dividend by redeeming its debentures (all owned by the parent company) in advance of the nominal dates. This year, however, the Railway has doubled its distribution to 33 Esc. per share, at the same time ceasing advance redemption. Although the net cash inflow to Tanks is roughly the same, therefore, the fact that the profit from advance redemptions was credited direct to reserve means that the amount taken into profit and loss account is this year correspondingly increased.

This difference in accounting means that a cushion has been placed between Tanks and the cutting of the Union Minière distribution by 35 per cent. Without this, the drop in profits from £4,309,796 to £3,446,103, severe though it is, would have been sharper still, and it is probably for this reason that the dividend has been so steeply reduced—from the equivalent of 4s. 9d. per share last year to 3s. 3d. plus 6d. tax free this year. Obviously, too, the board must have had in mind the fact that even if copper were to recover strongly at the present time, next year's revenue from Union Minière would be dictated by 1958 copper prices.

ZAMBESIA AND KENTAN

The boards of Kentan Gold Areas and of Zambesia Exploring Co. have announced proposals for a regrouping within the Zams-Tanks organization. It is proposed that Kentan will write down its 1s. shares to 4d. and then consolidate these into £1 shares. Subject to court and C.I.C. permission, Kentan will then offer new shares to Zams holders on a one-for-one basis. Assuming a 100 per cent response from Zams shareholders, the final position will thus be that Zambesia will become a wholly owned sub-

LONDON MARKET HIGHLIGHTS

South African gold shares opened the week in encouraging form. A certain amount of Cape and United States buying saw prices steadily edge ahead, and in Throgmorton Street it was thought likely that the movement would be helped on its way by a burst of option buying in front of the September quarter's reports due next week. In the event, option buying was rather small and concerned Free State Geduld in the main. As far as quarterlies were concerned, there was little in the way of the usual forecasting, but a steady demand at one time for Harmony (39s.) was said to be inspired by hopes of more good development results.

After this, the forward movement in Kaffirs petered out and the market was not helped by the United States reaffirmation at New Delhi that no rise in the gold price was contemplated in Washington.

One firm exception to the trend was Free State Saaiplaas, which soon reached a three-year peak of 18s. on a persistent demand from Johannesburg. It was thought that this might have resulted from some switching out of Riebeeck, the view being strengthened by the fact that Riebeeck, after advancing to a new peak of 22s. 6d., smartly reacted to 21s. Otherwise, the market was intrigued by the strength, Cape inspired, of "Freddies" (6s.).

It was presumed that the September quarter's recovery in diamond sales figures had been already discounted in share prices, because the publication of the news had practically no market impact. More disappointing, further reports of Russian developments in this industry had an immediate bearish effect on share prices, although the reports themselves did no more than repeat earlier statements. Platinums, too, were none too happy when it was learned that the Rustenburg group of companies did not intend to pay any final dividends.

If the start of option dealings had little effect on Kaffirs, they certainly began to make themselves felt in some of the base metal share markets. On the whole, copper shares were erratic but both Roan (9s. 0¼d.) and R.S.T. (18s. 6d.) firmed up when Roan's final dividend of 4d. gross became known early on Thursday. Bancroft was also higher at 21s. 9d. on hopes that the firmer metal price might mean a resumption of production.

Among tins, Beralt somewhat unexpectedly advanced 3s. 6d. to 25s. 6d. in front of the annual report. It was difficult for anyone to see just what could be bullish in the report of this hard-hit tin and wolfram producer. Moreover, when in the event the report turned out to be downright discouraging, the share price lost only 9d. of its previous advance. The explanation for this state of affairs seemed to lie with the buyers of options on Beralt, who hoped that in the next three months wolfram, and possibly tin as well, would both improve and with them the share price of Beralt. Among other tins, Southern Malayan (9s. 7¼d.) pleased the market with its latest dividend, but Hongkong sagged to 4s. on the news of the temporary close-down.

Otherwise the take-over offer to Kentan Gold by Zambesia Exploring proved to be a particularly well-kept secret. On the night when the news and terms of the offer were released, Kentan had closed at their usual 3d. The following day they were quickly marked up to 8½d.; Zambesia eased 6d. to 45s.

sidiary of Kentan, the £1,333,333 capital of which will be owned as to £1,000,000 by the former Zambesia shareholders and £333,333 by the former Kentan holders, a large proportion of whom are within the group anyway.

For the Kentan shareholder the advantages are obvious. Using the current Zambesia quotation of about 45s. as a yardstick, the operation puts a value of about 9d. on the present Kentan shares, compared with a market valuation before the proposals were announced of around 3d. Additionally, he would be able to look forward to the prospect of dividends which, although meagre in relation to Kentan shares in their present form, would certainly be better than no bread at all.

The Zambesia shareholder, on the other hand, may well look somewhat askance at the proposed deal. He may well ask why a company both prosperous at the moment and with excellent long-term prospects should be prepared to offer one-quarter of its share capital in exchange for Kentan Gold Areas, a property which, because of a long sequence of misfortunes, has never yet looked like making significant profits, and additionally is encumbered with a debt totalling about £675,000.

The answer, or part of it, lies in the relative taxation positions of the two companies. Kentan pays no tax, because what must by now be an extremely substantial tax loss has been accumulated over the years. In contrast, out of gross profits of £104,319 earned by the Zambesia company in the year to March 31 last, £74,621 went to the tax collector. In fact, last year's dividend of 20 per cent was largely met by transferring £75,000 from general reserve. Obviously any significant reduction in this tax liability will make a considerable difference to Zams' ability to maintain its dividend through the coming lean years.

As far as operations at Geita are concerned, Zams must now feel that the mine is at last round the corner. When it was announced a few months ago that the metallurgical problems had been overcome, it was stated that operations would be continued for two years at 18,000 tons monthly. At the same time, a further £150,000 was made available to the company from within the group. The tie-up with Zams, whose balance sheet is extremely liquid, will mean that short-term finance should no longer be the problem it has been in the past should further infusions become necessary.

NO RUSTENBURG FINAL

As had been generally anticipated, Rustenburg Platinum (and hence Waterval Union and Potgietersrust) is to pay no final dividend. Preliminary results for the year ended August 31 reveal that net revenue before tax slumped from £3,652,000 in 1957 to £879,176.

In a statement accompanying the results, the board says that the outlook both for the volume of sales and for the price of platinum remains obscure. In these circumstances, the whole of the year's profits, including a transfer from general reserve on account of stores realized, is to be devoted to reducing the excess of capital expenditure over funds raised and profits appropriated. After a year's expenditure and retentions, this balance still amounted to some £1,000,000, and to cover this the company has raised a loan of £1,000,000 from the Standard Bank. The loan bears interest at 6½ per cent, and will be repayed by instalments of £200,000, the first falling due in April, 1959.

Total sales of platinum during the year, says the statement, were about 50 per cent below the previous year's level. In view of the uncertainties of the situation, it is considered impossible to estimate reliably the sales for the current year. Nevertheless, it is pointed out that 1958 profits were earned with platinum averaging £27 15s. per oz., compared with a current quotation of £21 5s. Unless there is a material reversal of the trend, therefore, profits for 1958-9 may be even smaller than those earned this year.

BERALT AND WOLFRAM

Wolfram is not one of the spectacular ores. While copper, tin, lead and zinc have rarely been out of the news as a result of the efforts to bolster their declining prices, the wolfram price has declined week by week comparatively unnoticed. Yet percentagewise, the price of this ore has fallen more than that of almost any other mining product—the current quotation is 62s. 6d., compared with 162s. in April last year.

For a producer such as Beralt, this is nothing short of a disaster, and the fall in net taxed profit from £325,574 to £104,337 for the year to March 31 last comes as no surprise. Indeed, the wonder is that the decline is not of even larger proportions.

There are, in fact, two reasons why Beralt has been able to prevent its earnings from falling further. The first was the introduction of the O.T.C. taxation concessions in 1957. After hiving off its U.K. sales organization last September, Beralt was able to take full advantage of the new arrangements. This is reflected in the accounts by the reduction in the tax provision from £550,543 to £114,043, and the write-back of £215,349 no longer required.

The other reason is the fact that Beralt's output is fairly flexible as between tin and wolfram. The management has, therefore, been able to reduce wolfram production to the minimum consistent with the company's contractual obligations, at the same time doubling the monthly rate of tin output (Portugal not being a quota country). At the current price, of course, wolfram production is quite uneconomic.

KWAHU PAYS AGAIN

Kwahu is an interesting example of the mining company which has reconstructed itself as a finance or holding organization. In this particular case the interest lies in the fact that although reasonable profits were earned in the 1956 and 1957 financial years, the company was unable to pay a dividend because of heavy depreciation of the book value of its investments. In March this year, however, the situation was righted by writing off these book losses against the share premium account, and in accordance with the hint given at that time a dividend of 15 per cent is now recommended.

The accounts for the year to June 30 show that dividends and interest received amounted to some £20,700, against £8,700 in the previous year. This improvement is not reflected in the net profit, however, as share-dealing profits were reduced from £18,431 to £4,303. Thus net earnings for the year came out at £17,625, about £3,000 less than in the previous twelve months, sufficient to increase the carry-forward to £8,101 after deducting £9,565, the cost of the dividend.

Kwahu's portfolio is somewhat unusual. The hard core is a well-balanced group of mines which includes substantial holdings in Ghana Main Reef and Esperanza Copper, as well as interests in many of the more important mines in South Africa, Canada, Nigeria, and Ghana. In addition to this there are one or two oil shares and a leavening of other securities of the most varied types, ranging from "Bats" through a brace of property shares to Ranks and Enfield Rolling Mills. At September 23, this portfolio was worth some £224,329 against a book value of some £162,000. If the excess of current liabilities over cash assets be deducted from this, the company appears to be worth about £218,000 on an asset valuation (excluding unquoted investments and land holdings)—about 4s. per share compared with a current market price of around 3s. x.d. For a portfolio of this calibre, this must

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seem a wide differential. Probably the reason is the fact that the two largest single holdings are in Ghana Main Reef and Esperanza Copper and Sulphur. The former must be nearing the end of its life, while the outlook for Esperanza is problematical at best. Nevertheless, it is probable that the risks inherent in both these investments are already fully discounted in their market quotations. Kwahu could prove to be a most profitable investment over the next few years.

UPTURN IN DIAMOND SALES

Although the September quarter's diamond sales of £16,072,686 are still well below the peak of £21,444,588 reached in the corresponding three months of last year, they show the first reversal of the downward trend which has persisted since that time. An upturn of 5 to 10 per cent is usual in the September period, but the increase this time is of the order of 15 per cent over the June sales of £13,934,105.

The table below divides the sales of the last fifteen months between gemstones and industrial diamonds.

Quarter	*Gem*	*Industrial*
1957	(£000)	(£000)
September ...	15,114	6,330
December ...	12,264	5,372
1958		
March ...	10,514	4,776
June	10,735	3,199
September ...	12,845	3,228

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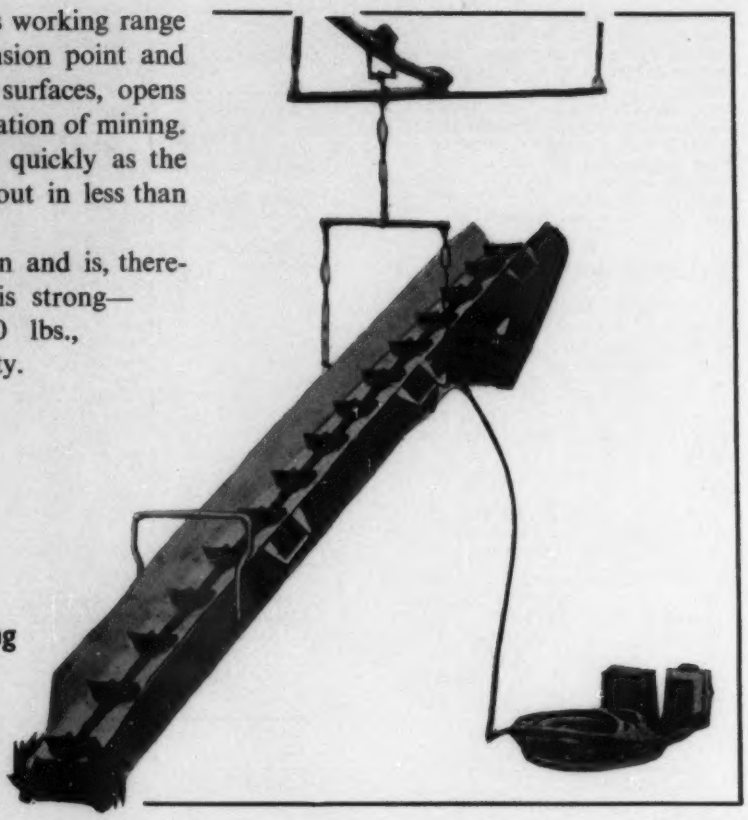

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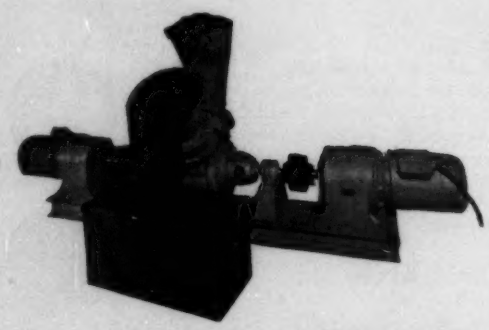

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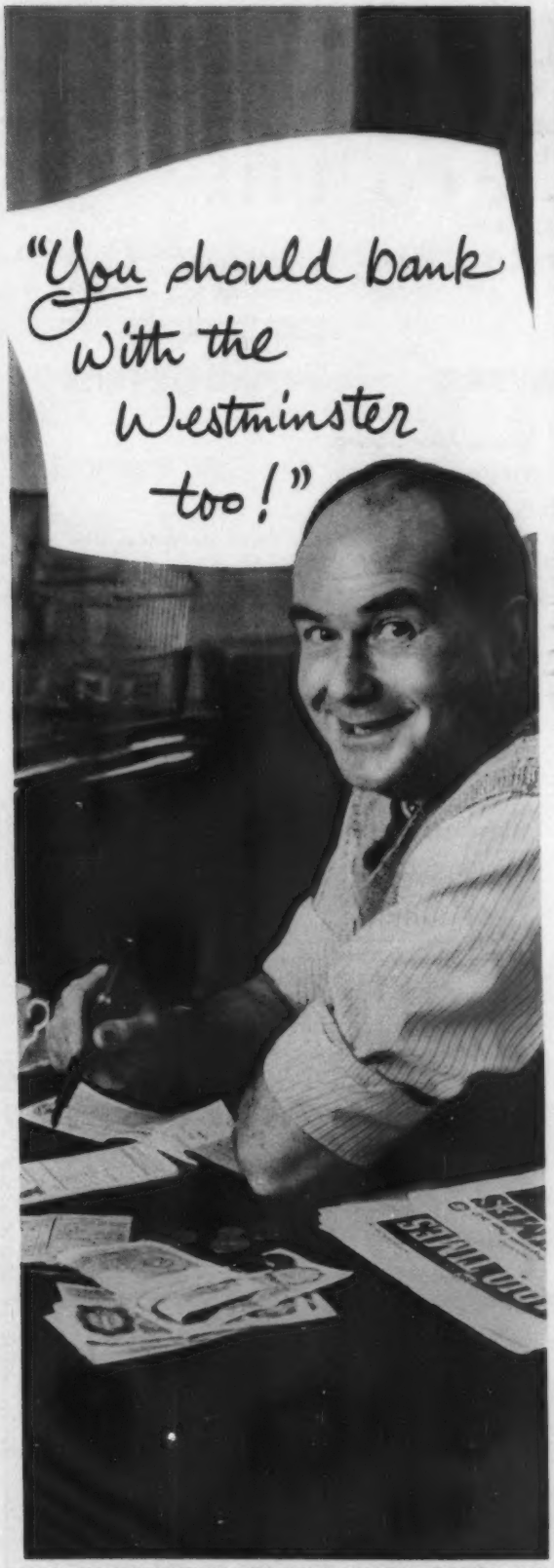

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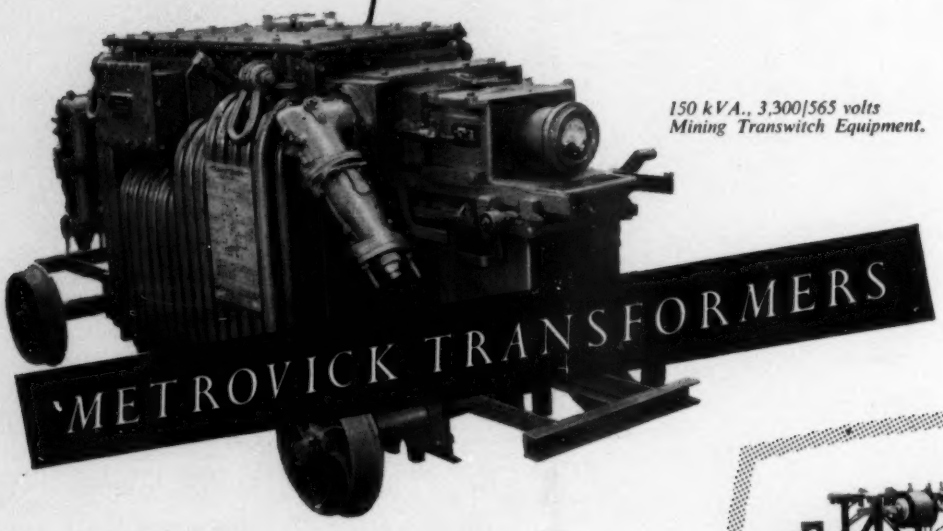

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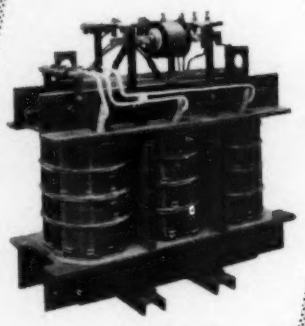

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